



Blockchain

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World Economic Forum

Globalization 2.0

<https://toplink.weforum.org/knowledge/explore>

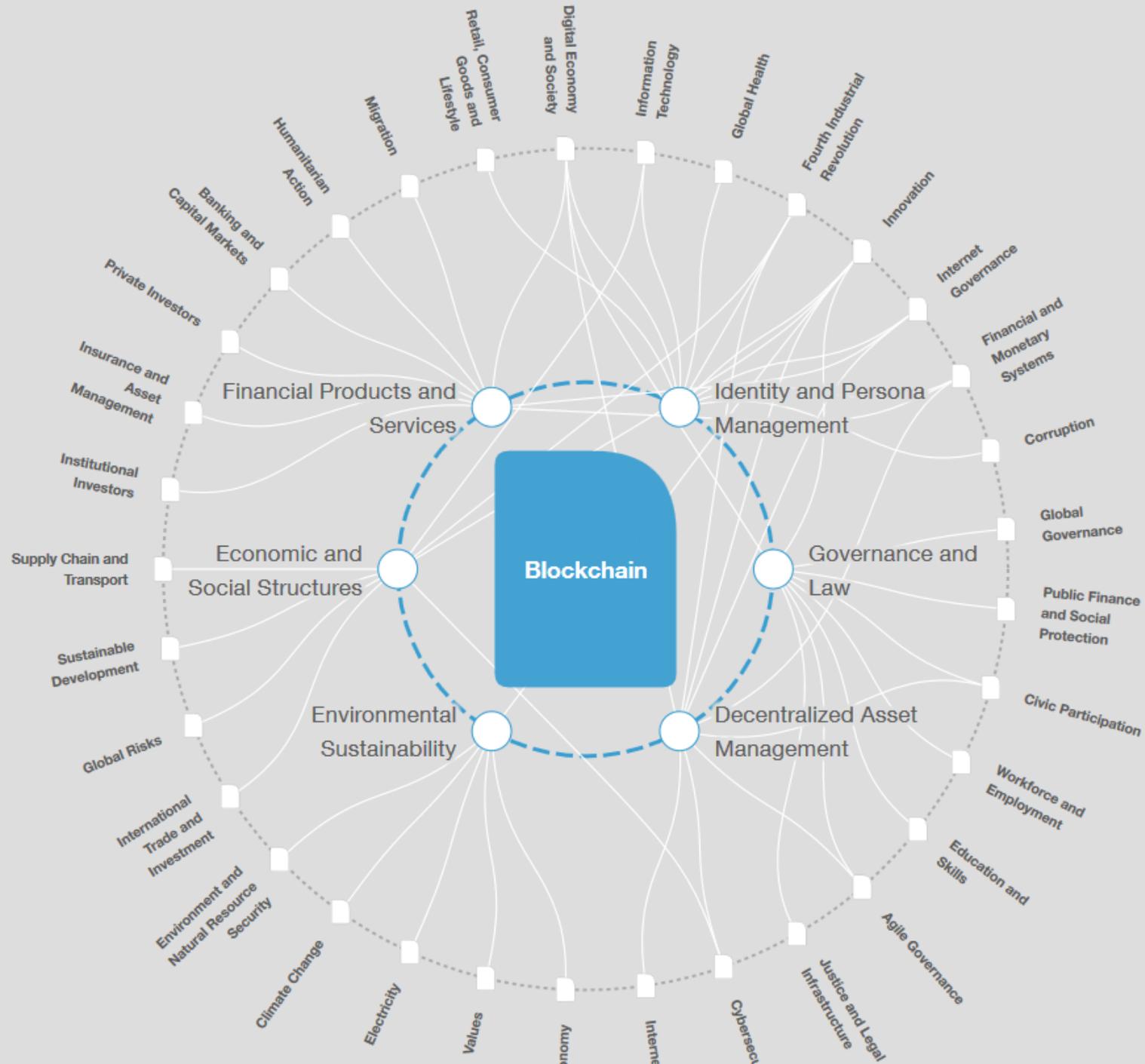
Mapping Global Transformation

<https://toplink.weforum.org/knowledge/insight/a1Gb00000038qmPEAQ/explore/summary>

The background of the slide is a dark, deep blue space filled with a dense field of bright, multi-colored stars and nebulae, primarily in shades of cyan, teal, and light blue, creating a sense of depth and vastness.

Mapping Global Transformations

Harnessing the Forum's Collective Intelligence





**“THERE WILL BE A BLOCKCHAIN
IN YOUR FUTURE, WHETHER
YOU LIKE IT OR NOT”**

(Source: IEEE Spectrum, 2017)



“Ex Nihilo Nihil”



Reviewing the Blockchain Technology

Blockchain 1.0: Bitcoin

Blockchain 2.0: Ethereum
and Smart Contracts

Blockchain 3.0: Internet of
Things





How will Blockchain Change the World?

A new era on transactions

- Bitcoin: digital currency
 - Paying for a ride
 - Repository for paid movies
- Secure data sharing
 - Homework submission
 - Self-control on health data
- Ethereum – Smart contract
- Hyper ledger – Business-oriented
- Many others...



Do we need the middleman?

No!



Blockchain Technology Advent & Bitcoin



Blockchain and Bitcoin

- Blockchain is not just Bitcoin, but they are closely related. Watch "Blockchain vs. Bitcoin" video here:
- Blockchain is the technology underlying the Bitcoin.
- Bitcoin is the first application of the blockchain.
- Blockchain is defined as a decentralized distributed system which ensures a highly secured transaction mechanism.
- Bitcoin is defined as a cryptocurrency or digital money.



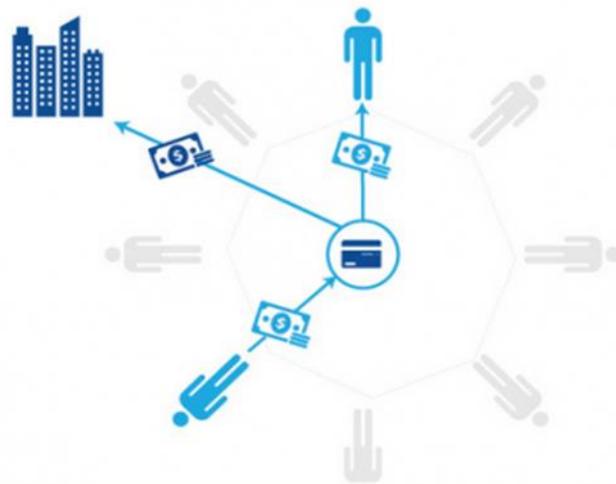
Watch "Blockchain vs Bitcoin" video here:

<https://youtu.be/MKwa-BqnJDg>

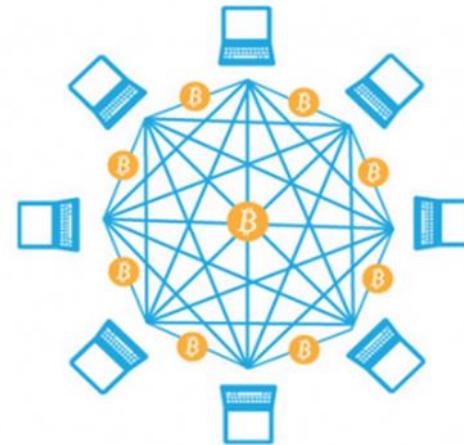


Bitcoin

- Distributed, Decentralized Digital Currency Introduced by Satoshi Nakamoto in 2008



Traditional transactions require a third-party Bank to transfer money.
Banks charge high **processing fees**



Peer-to-Peer transactions using Bitcoin, which is based on *blockchain technology*, allow for direct payment between individuals **without any fee**



Satoshi Nakamoto

- The person or the group who introduced Bitcoin in 2008 in a white paper.
- Founder of the idea of Blockchain/Bitcoin
- The real identity of the author is not revealed, yet.
- Wrote the Blockchain/Bitcoin white paper
- Released the first Bitcoin code
- Inspired other developers on Blockchain

Bitcoin: A Peer-to-Peer Electronic Cash System

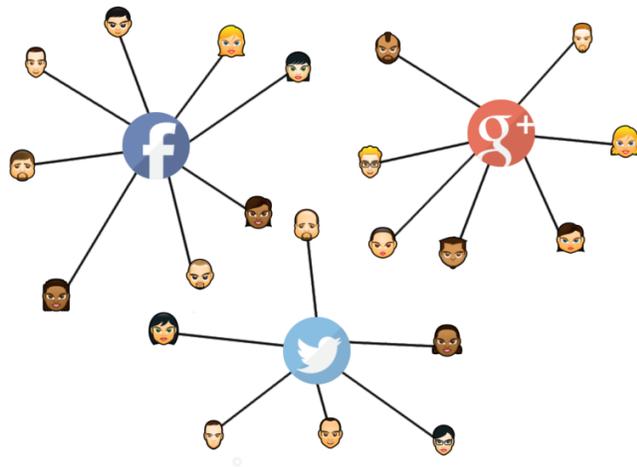
Satoshi Nakamoto
satoshin@gmx.com
www.bitcoin.org

Abstract. A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double spending.

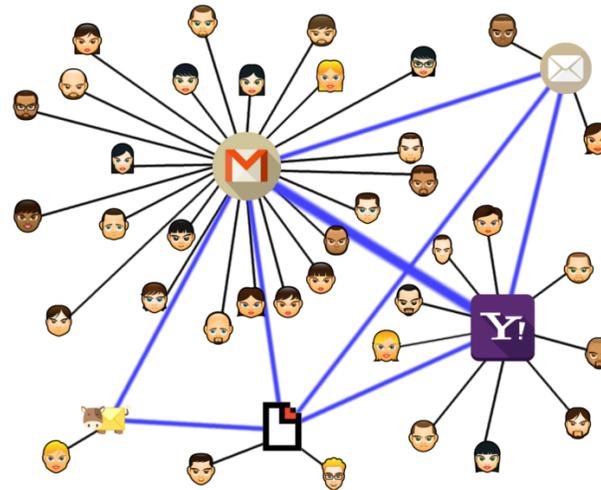


Network Types

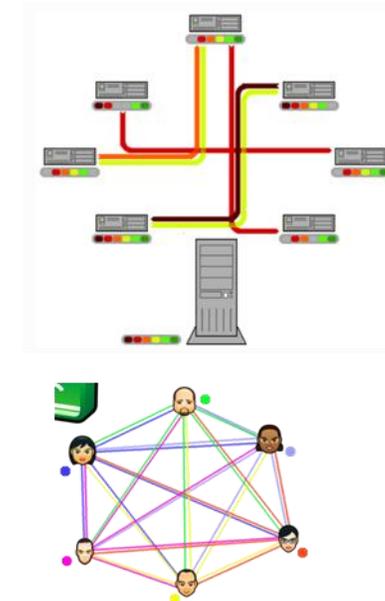
- Centralized network
Example: Traditional corporations



- Decentralized network
Example: Social and Communication Networks



- Distributed network
Example: Torrent, Blockchain



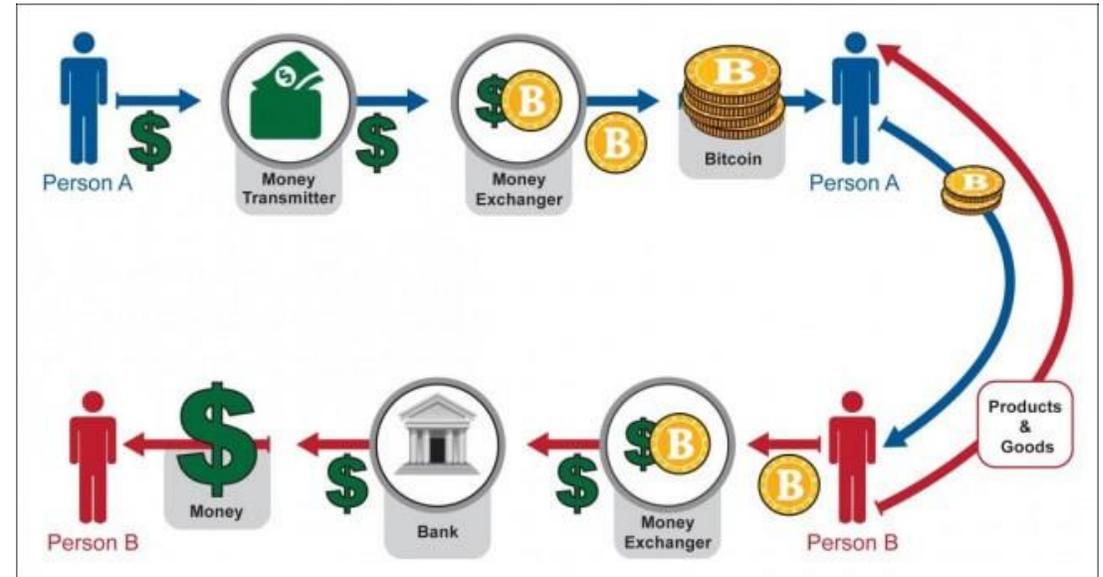


Bitcoin Transaction

Distributed, Decentralized Digital Currency

Concepts associated with the process:

- Wallet Address
- Mining Process
- Transaction Validation
- Chaining



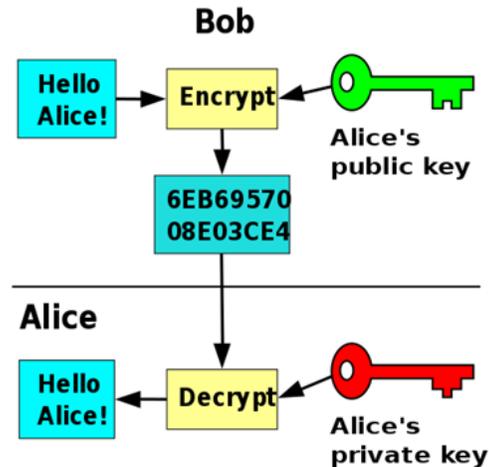


Wallet Address



Watch "How Bitcoin Works Under the Hood" video here:

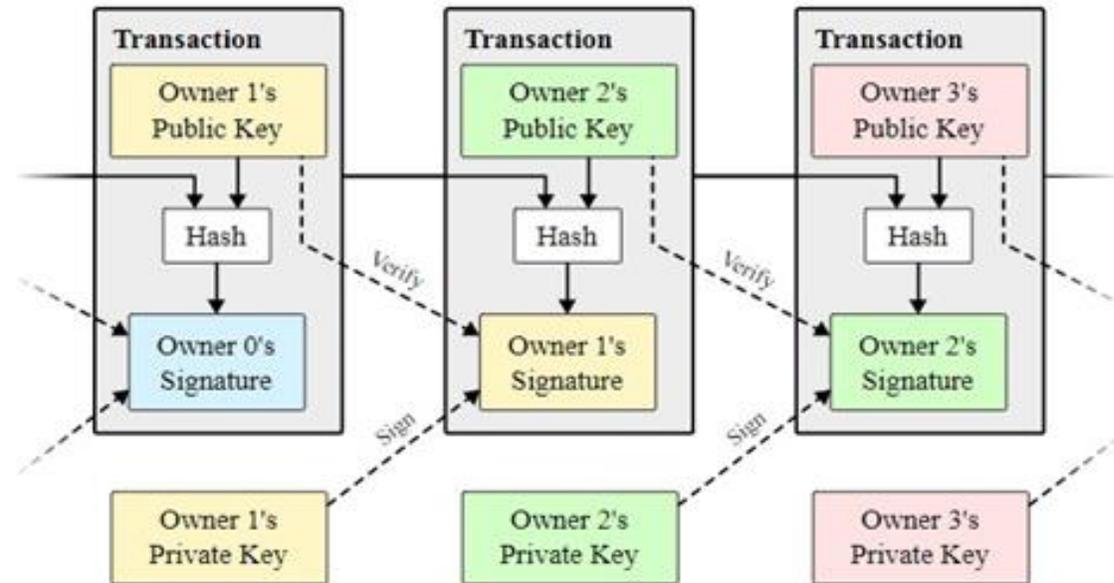
<https://youtu.be/Lx9zgZCMqXE>



Every node has:

1-Private key

2-Public Key



- Electronic coin == Chain of digital signatures
- Bitcoin transfer: Sign (Previous transaction + New owner's public key)
- Anyone can verify (n-1)th owner transferred this to the nth owner.
- Anyone can follow the history

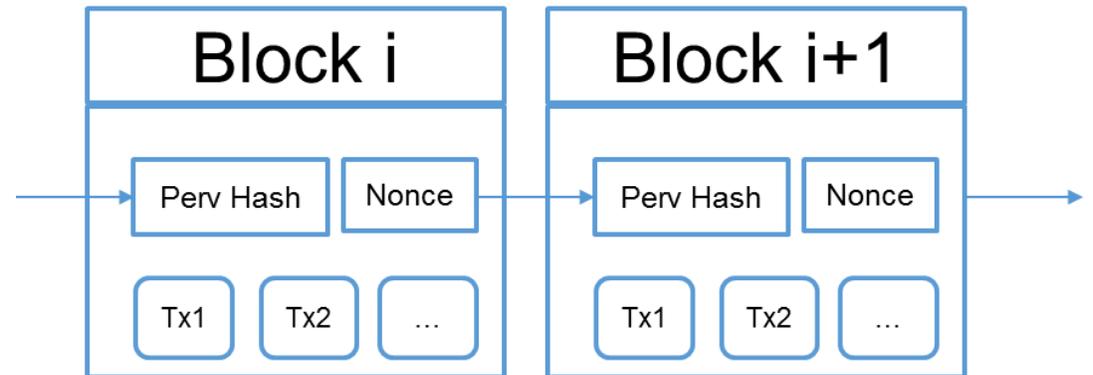


Transaction Validation

- To validate transactions without a trusted third party, there is a “double spending” problem, when the user can spend one unique digital asset twice.

Blockchain solutions:

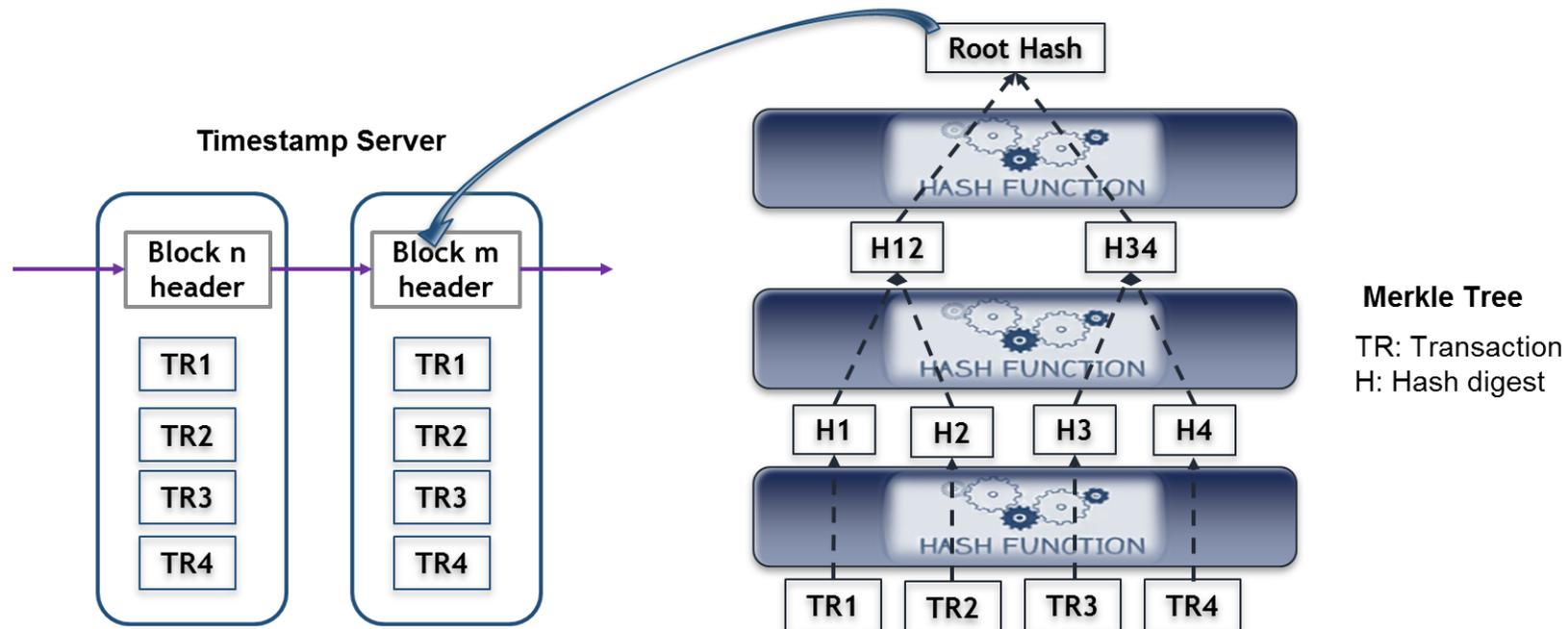
- Timestamp
- Proof of Work





Chaining (1)

- The first duty of mining is validating transactions, encrypt them and put them in the new block.
- Encrypting transactions and adding them to the new block is done using Merkle tree and hash root concepts.



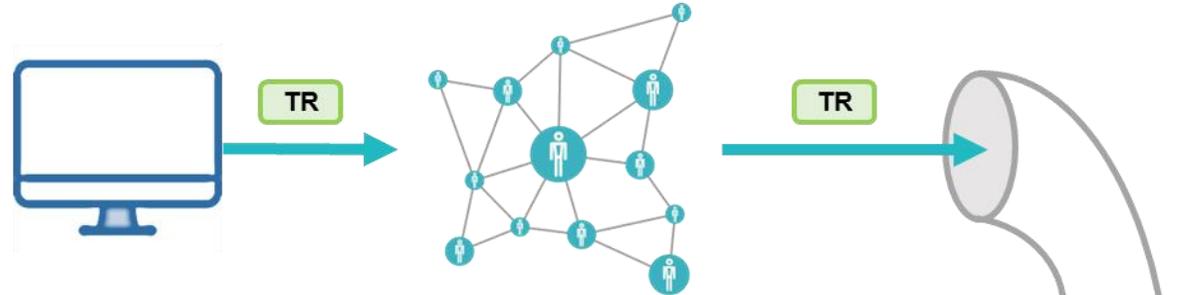


Bitcoin Mechanism

Start Here
↓

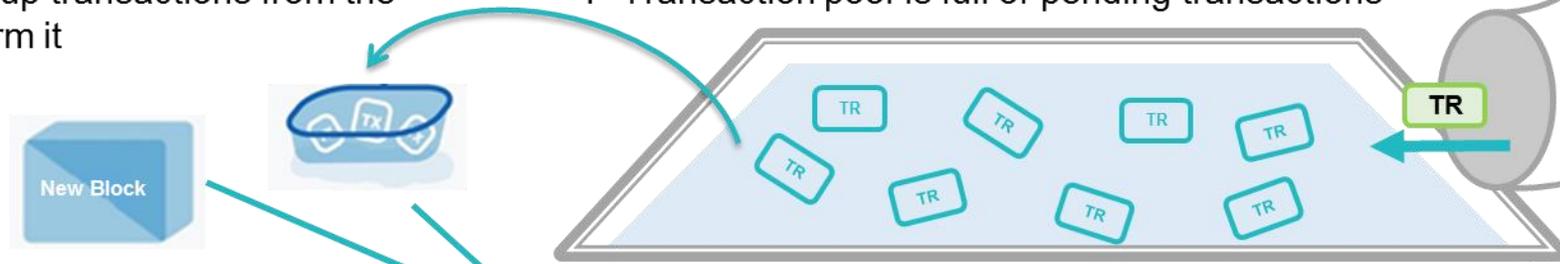
- 1- You **Sign** your transaction
- 2- You **Send** the transaction to the network

3- Your transaction goes to blockchain network



5- Miners pick up transactions from the pool and confirm it

4- Transaction pool is full of pending transactions



6- Miners will put the transaction in a block and add the block to the chain (chaining)



Watch "How Bitcoin Works in 5 Minutes" video here:
<https://youtu.be/I9jOJk30eQs>



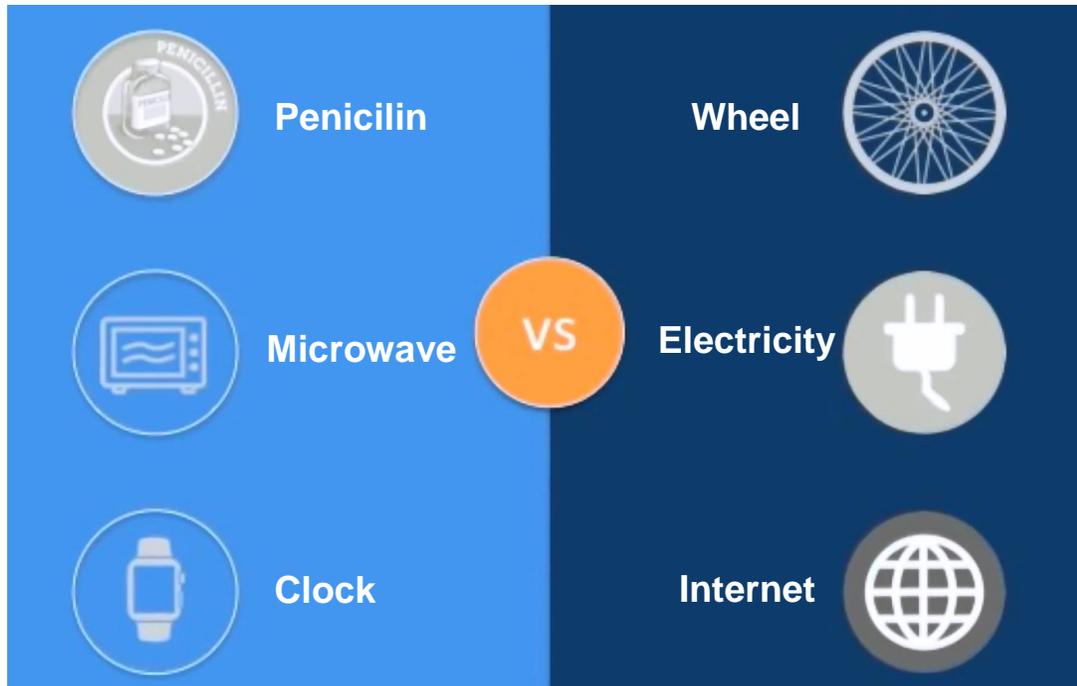
Blockchain Technology Evolution



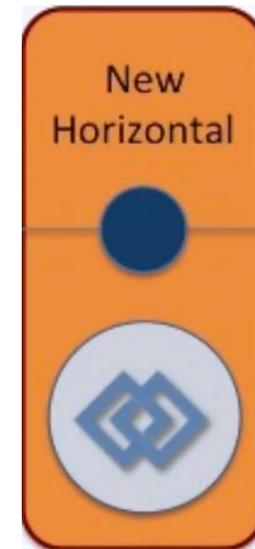
How Blockchain is Important in Real World?

Vertical Innovation
Innovation

Horizontal



Blockchain is a new horizontal innovation



❓ Think about the industries which can be changed by Blockchain technology?



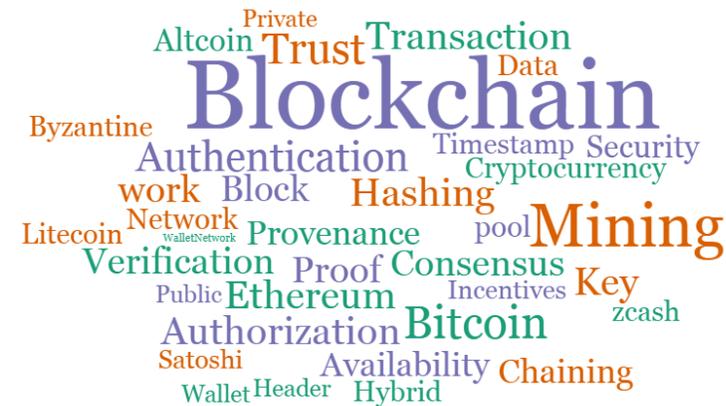
Definition: Blockchain

NIST:

- “Blockchains are immutable digital ledger systems implemented in a distributed fashion (i.e., without a central repository) and usually without a central authority. At their most basic level, they enable a community of users to record transactions in a ledger that is difficult to modify.”

IEEE:

- “A shared database that grows only by appending new data, authenticates users with strong cryptography, and leverages economic incentives to encourage mistrustful strangers to manage and secure updates.”





Blockchain – much more than Bitcoin

- Blockchain is the system that Bitcoin is embedded in
- Bitcoin is the application of blockchain technology that made it famous.
- However, blockchain technology is much more than recording monetary transactions.
- Startup companies, initiatives, corporate alliances, and research projects have been launched using blockchain technology.
- Blockchain can offer better technology than conventional databases.



Blockchain and Complexity

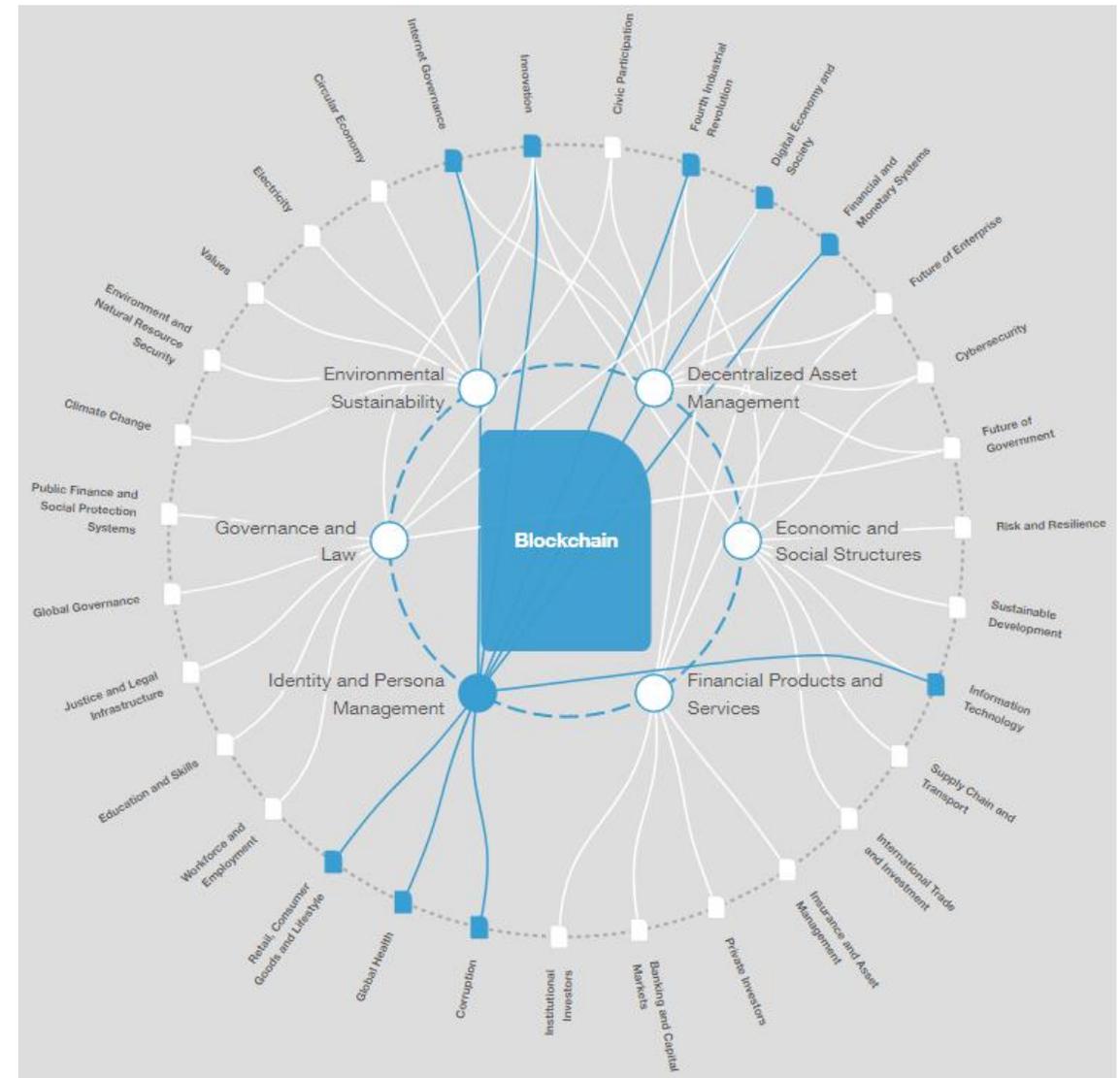
Blockchain enables new mechanisms by which to deliver financial services, and redefine:

- Government,
- Legal services,
- Accountancy,
- Supply chains and
- Energy distribution.



Reference:

<https://toplink.weforum.org/knowledge/insight/a1Gb00000038qmPEAQ/explore/summary>





Crypto Valley Initiative, Zug, Switzerland, 2017

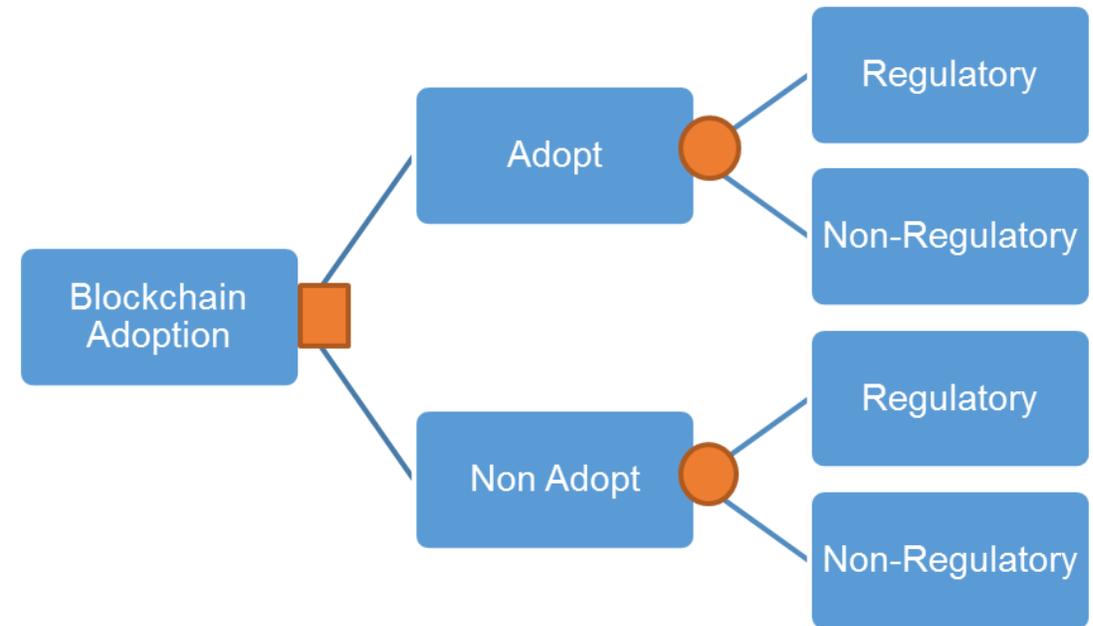




Blockchain Adoption: A Multidisciplinary Assessment

- Blockchain adoption depends on the regulatory structure of the sector of the enterprise.
- An analytical decision-making method is required to evaluate the adoption of blockchain by this enterprise by considering uncertainty in the regulatory options.

- Decision point
- Uncertainty in decision making





Blockchain Technology Leaders

- IBM (<https://www.ibm.com/blockchain>)
- Microsoft (<https://azure.microsoft.com/en-us/solutions/blockchain>)
- Accenture (<https://www.accenture.com/us-en/service-blockchain-financial-services>)
- Oracle (<https://www.oracle.com/cloud/blockchain/index.html>)



Blockchain Technology Mechanism



Definition: Ledger

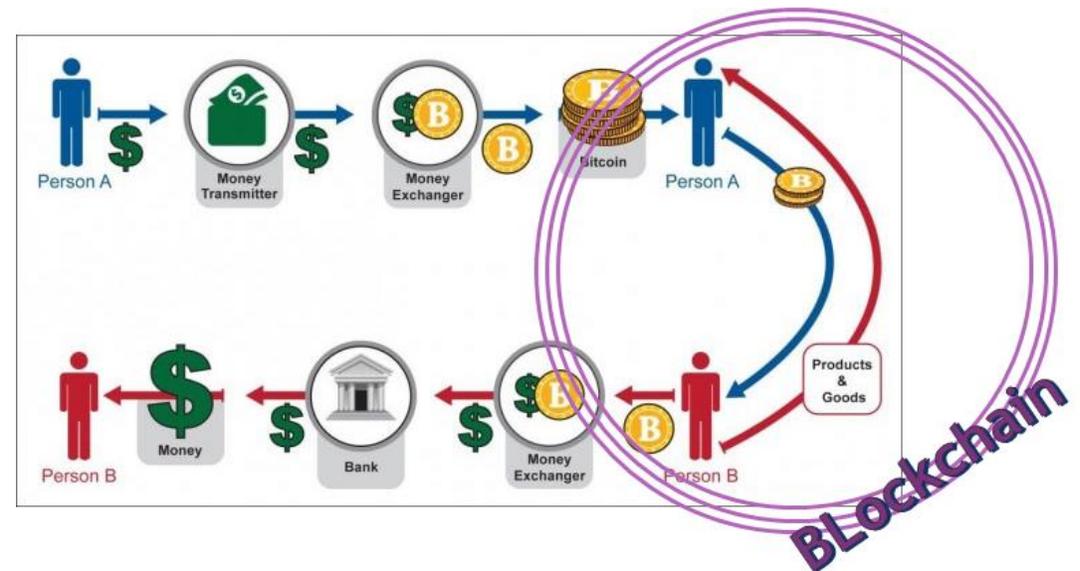
- **Ledger:** List of transactions
- **History:** pen and paper ledgers have been used to keep track of the exchange of goods and services
- **Centralized ledgers** may have shortcomings in terms of security, validation, confidentiality, and trust.





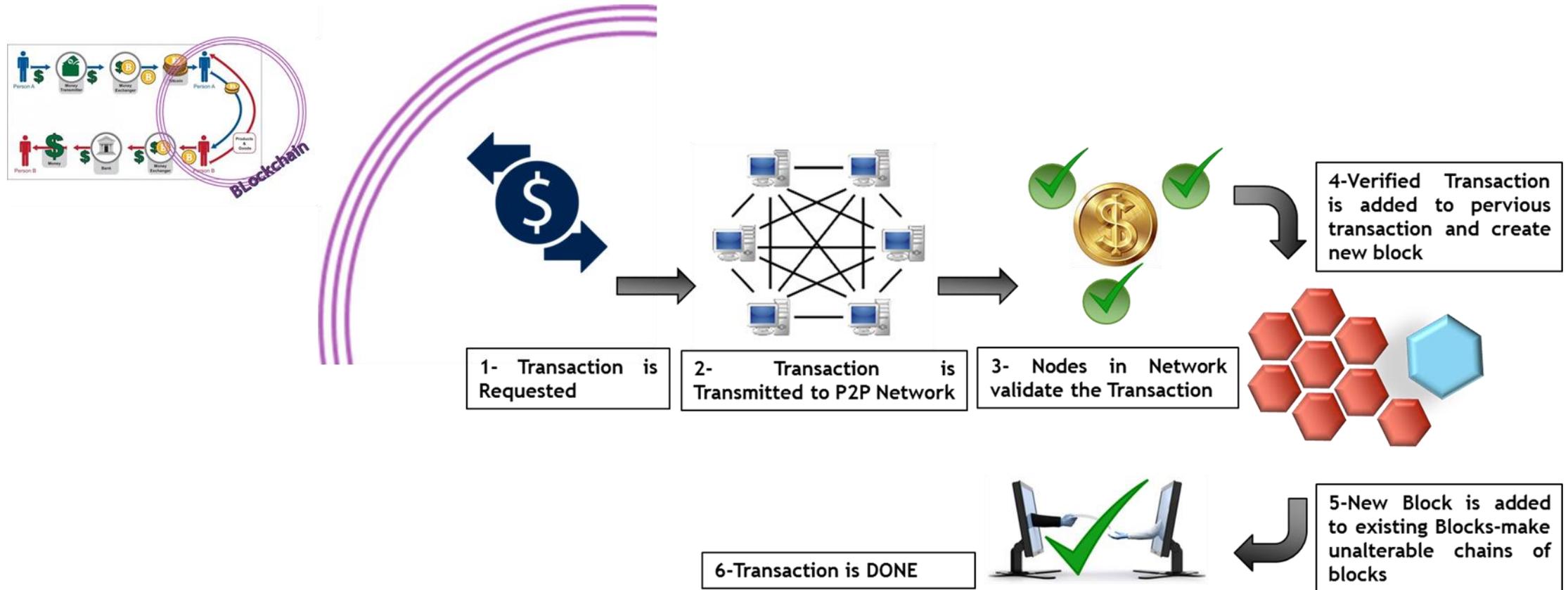
How Does Blockchain Work? (1)

- Single, universally accessible digital ledger
- You can see and have the ledger.
- Only change that can be done is adding a new block to the end.
- New transaction requests are aggregated and validated.
- If the new changes are trusted, transactions are encrypted and turned into a block
- Once it is there, it cannot be changed.





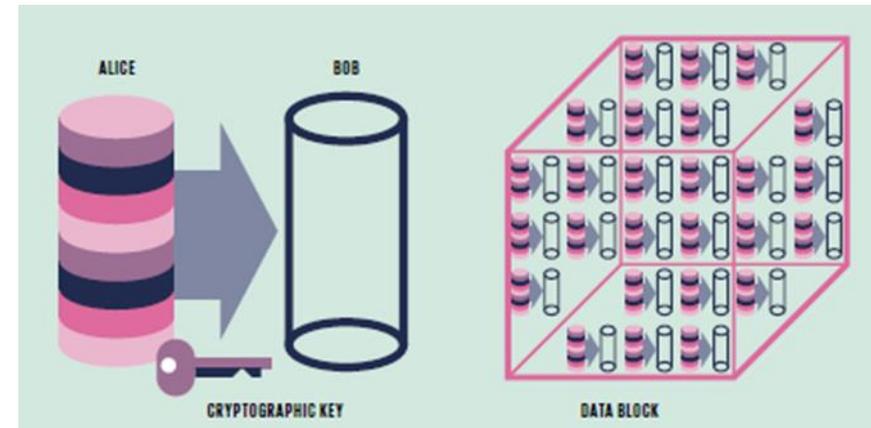
How Does Blockchain Work? (2)





Blockchains Mechanism – How?

- Nodes are interconnected
- Confirmed transaction is added to the ledger
- Updated ledger will be a new block added to previous blocks
- New updates are sent to all the network
- This process is done by Miners through consensus protocol

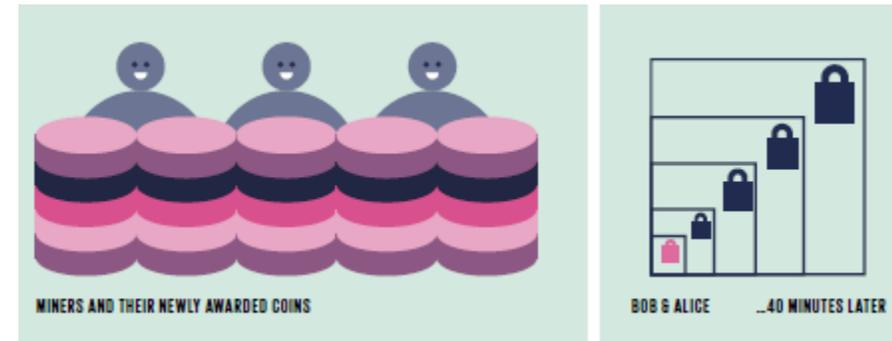




Blockchains Mechanism – Who?

Miners & Signers:

- Pay for Security
- Confirm Transactions
- Get Rewards

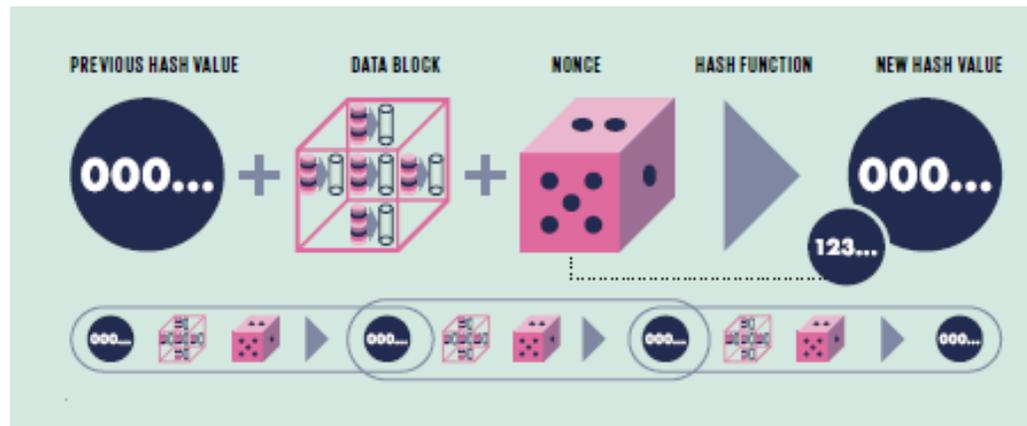




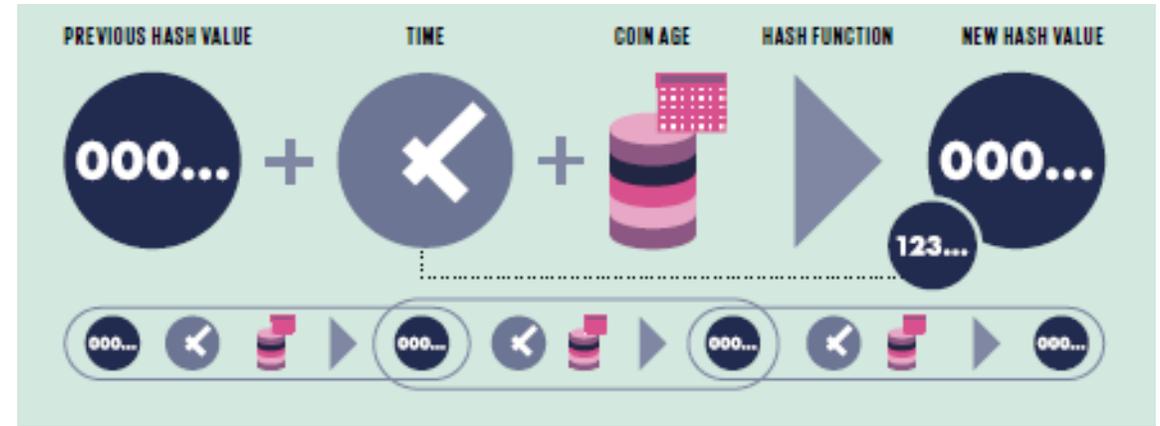
Blockchains Mechanism – When?

Consensus Protocol

Proof of Work (Bitcoin)



Proof of Stake (Peercoin)

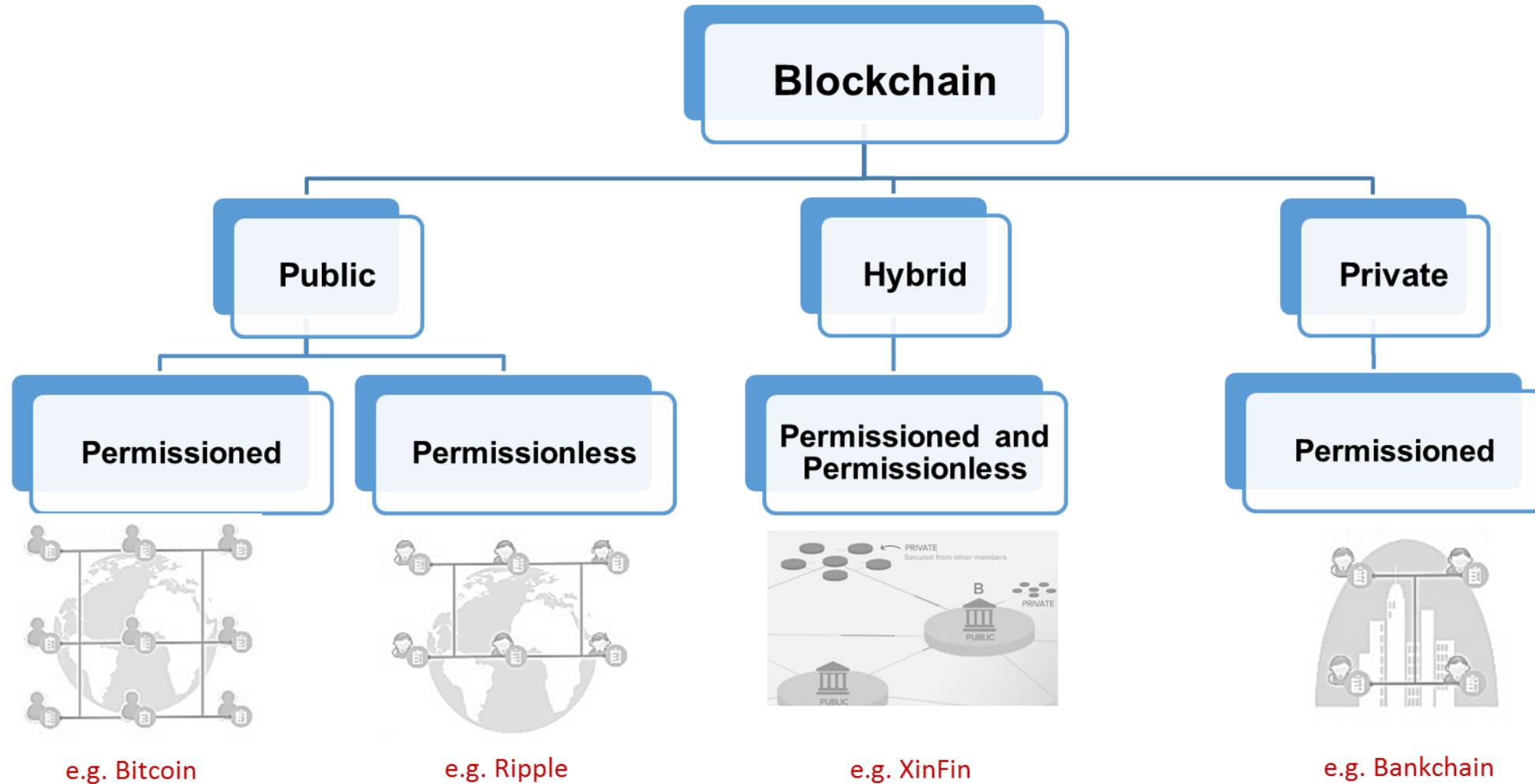




Types of Blockchain



Blockchain Types





Advantages of Blockchain Adoption



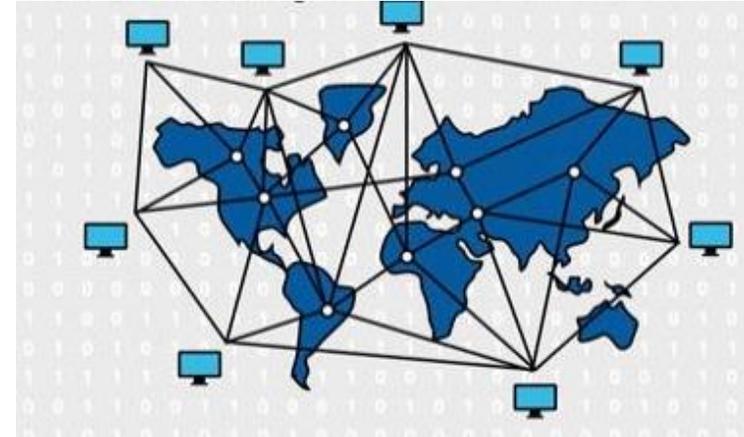
Advantages of Blockchain

- No Central Control
- Decentralized
- Immutable audit trail
- Data provenance
- Security and privacy
- Availability



No Central Control

- A misconception: No one controls a blockchain!
- However, while no user, government, or country controls a blockchain, a group of core developers is still responsible for the system's development.
- Developers may act in the interest of the community, and they can control the progress of the system within the consensus state.

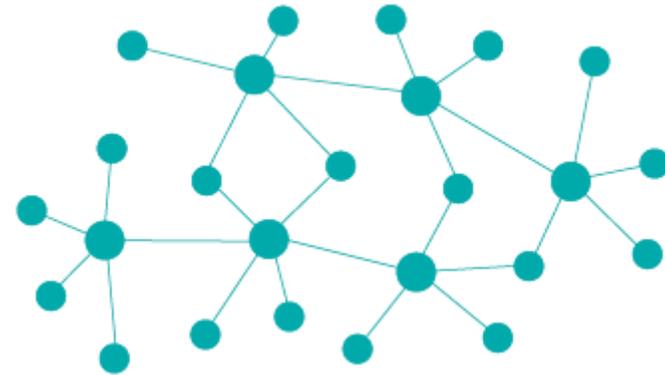




Decentralized Management

Decentralized management will distribute control and mitigate the risk of a single point of failure.

- Example1: Patient-managed health care records
- Example2: Real-time claim processing





Immutable Audit Trail

Blockchain will allow only to read and write functions. There is no possibility to update and delete ledger while it is submitted.

- Example 1: Unalterable patient records
- Example 2: Improved claim auditing and fraud detection

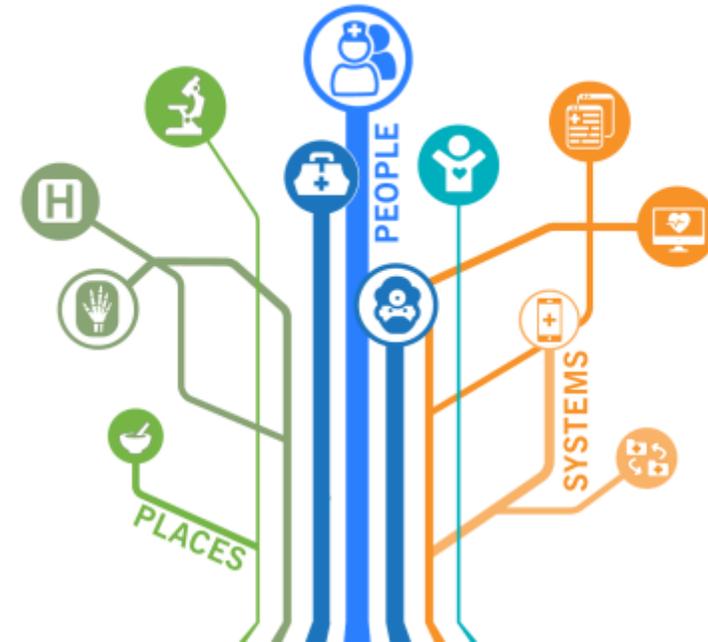




Data Provenance

Blockchain will ensure traceability and transparency by using a timestamp mechanism.

- Example 1: Source-verifiable medical records
- Example 2: Verifiable records for claim qualification





Availability

As blockchain is a distributed system, the participant has the right to access the records inside the network.

- Example1: Reduced risk of patient recordkeeping
- Example2: Enhanced accessibility of patient data





Security and Privacy

Using cryptographic algorithms in designing the public and private keys and using a secure hash function to encrypt transactions, blockchain will ensure security and privacy.

- Example 1: Increased safety of medical records
- Example 2: Increased security of patient medical insurance information





Challenges of Blockchain Adoption



Challenges of Blockchain

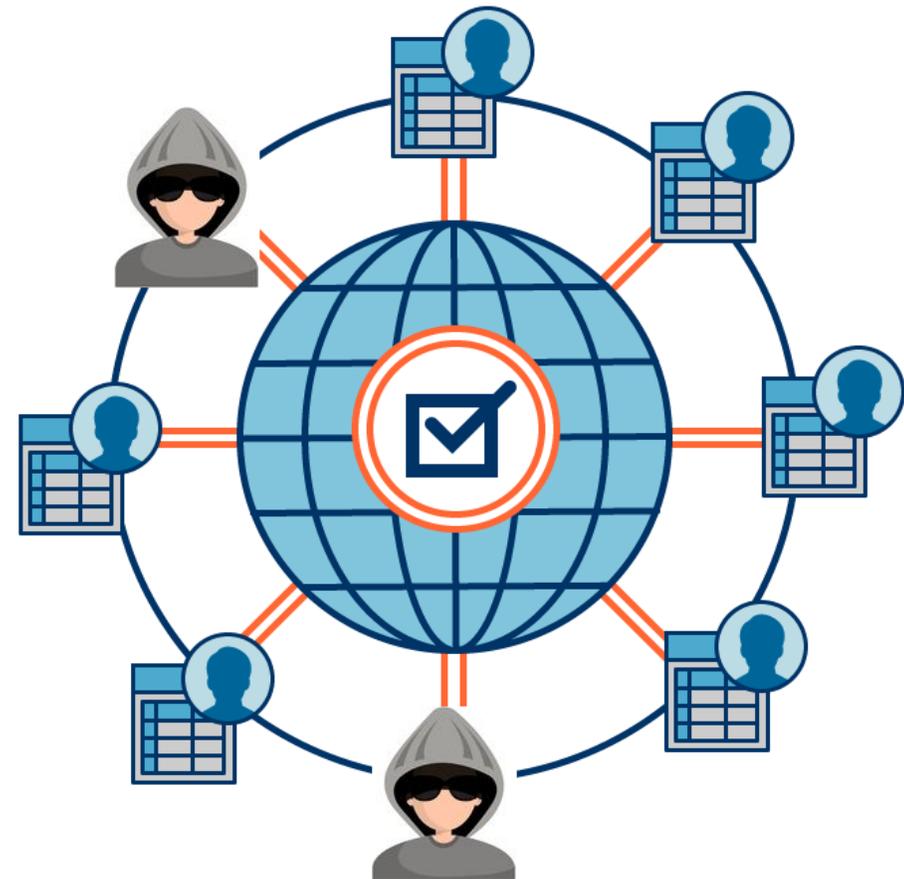
- Malicious users
- Trust misconception
- Installation and maintenance
- Transfer of burden of credential storage to users
- Private/public key infrastructure and identity
- 51% attack threat



Malicious Users

If malicious actors have enough power, they may act:

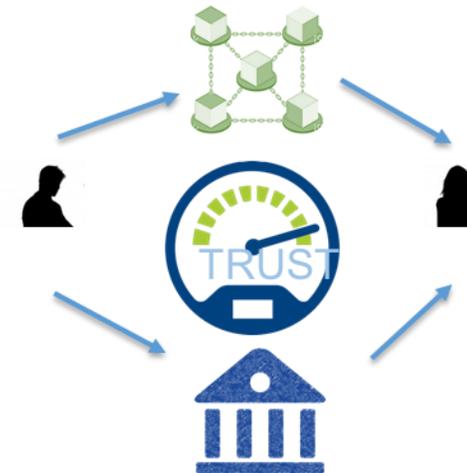
1. Ignoring transactions from specific users, nodes, or even entire countries.
2. Creating an altered, alternative chain in secret, then submitting it once the alternative chain is longer than the real chain.
3. Refusing to transmit blocks to other nodes, essentially disrupting the distribution of information.





Trust Misconception

- A Misconception: “There is no trusted third party in a blockchain” so it is “trustless” environments.
- A great deal of trust is required to work within a blockchain system:
 - Cryptographic technologies utilized
 - Secure bug-free software
 - Transparency
 - Fairly accepting and processing transactions



**TRUSTWORTHY
(SECURE)**

TRANSACTIONS
IN A

TRUSTLESS WORLD



Installation and maintenance (2)

Installation of Bitcoin Miners needs

- More and more computers
 - Faster computers (supercomputers)
 - Faster installation
 - And all need more money
-
- Bitmain as the world's largest supplier of bitcoin-mining has 21,000 machines computing approximately 250,000 trillion hashes per second,





Installation and maintenance (3)

Reduce Cost for More Gain

- Inner Mongolia:
 - Cheap electricity prices
 - 4 U.S. cents per kilowatt-hour
- Trade-off: Brutal climate, especially in summer
 - Extreme temperatures
 - Fluctuating conditions.
- Critical to managing the
 - Fan speed
 - Voltage
 - Frequency

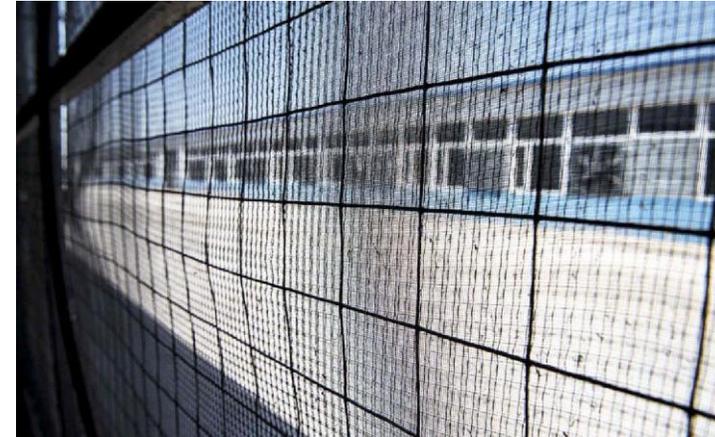




Installation and maintenance (4)

Keeping Operational

- Temperatures exceed 40 °C (104 °F).
 - Machines need ventilation
- Desert Fans: One full side of the warehouse is covered with desert fans
 - Liquid cooling system
 - Water evaporates and cools the interior.
- Nets to keep pollen and dust from getting inside.





Installation and maintenance (5)

Hardware Maintenance

- Software monitors the operating status of the thousands of mining computers
- Alerts workers when one fails
- Defective components are repaired
- Failed rig is
 - Extracted
 - Repaired
 - Tested
 - Turned into operation

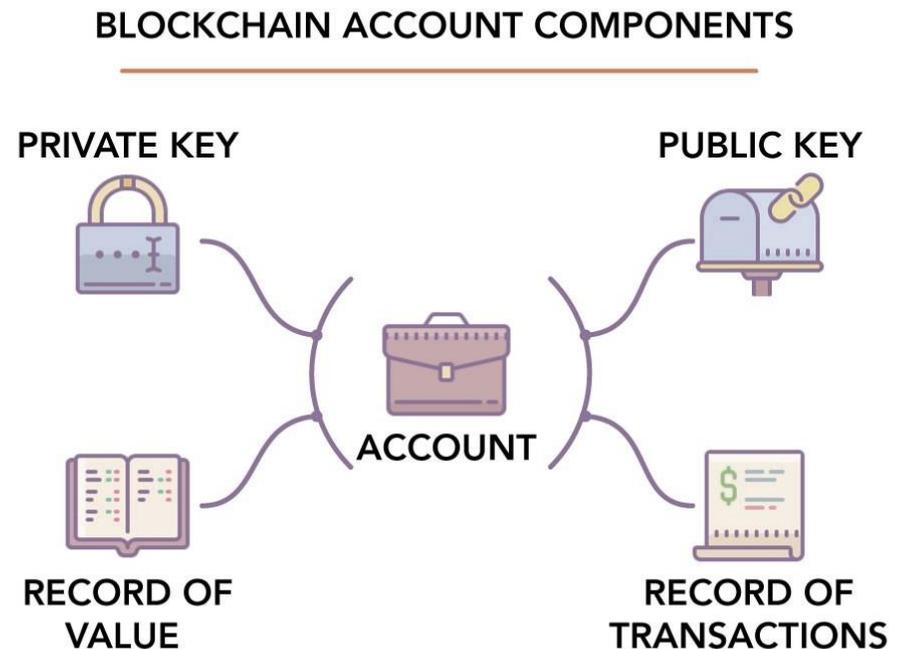




Burden of credential storage on user shoulder

- No intrinsic central place for user key management.
- Users must manage their private keys
- If the key is lost, digital assets are lost.

- There is no “forgot my password” feature for blockchain systems.
- Centralized management solutions exist
 - But create the same problems current systems have





51% Attack Threat

A blockchain network may suffer from the **51% attack**, which happens when there are fewer honest nodes than malicious ones in the whole network. In this case, malicious attackers will take control of the network.





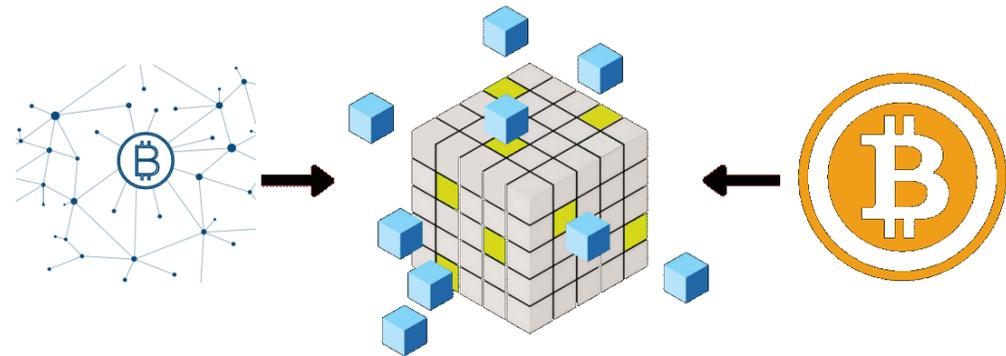
Speed and Scalability

The transaction time of blockchain can be long, depending on the consensus protocol; such a speed constraint may limit the scalability of blockchain-based applications.

For example:

Bitcoin: on average, 288 000 transactions per day (or about 3.3 transactions per second) with the proof-of-work protocol

Visa: on average, 150 million transactions per day (or about 2000 transactions per second)





Cryptocurrencies



Definition: Cryptocurrency

- A digital cryptographically secured asset which is designed as a medium of exchange
- Cryptocurrencies use cryptography to secure its transactions, to control the creation of additional units, and to verify the transfer of assets.
- Also Known as:
 - Digital currencies
 - Alternative currencies
 - Virtual currencies.





Cryptocurrencies: Where They Come From?

- First cryptocurrency: Bitcoin
- The investment in the mining process will determine who provides the approval of the transactions and get rewards for creating the new block.
- Cryptocurrencies remain in the system. In other words, the person who owns a cryptocurrency owns an encryption code to an amount of an encrypted currency in a blockchain.



Comparing Cryptocurrencies

Cryptocurrency	Exchange symbol	Launched	Anonymity	Max supply (Million)	Algorithm	Proof Type	Notes
Bitcoin	BTC	2009	High	~21m	SHA256	PoW	First blockchain.
BCH	BCH	2017	Low	~21m	SHA256	PoW	Hard fork on Bitcoin
Dash	DASH	2014	Low	22 m	X11	PoW/PoS	Faster transaction using "masternode" network
Ethereum	ETH	2016	Low	Infinite	Ethash	PoW	Based on smart Contract
Ethereum Classic	ETC	2015	Low	Infinite	Ethash	PoW	Hard fork on Ethereum
Litecoin	LTC	2011	Low	~84 m	Scrypt	PoW	Faster transaction compared with Bitcoin



Do Cryptocurrencies Have a Value?

- The idea of creating digital money is naturally something that has attracted many more or less serious actors.
- Digital money like the current shape of currencies has three functions:
 - As a medium for payments: money make trades cheaper and efficient
 - A standard for accounting: ease the ability to compare and control businesses and people in terms of worth, earn, spend, invest, etc.
 - A way to store value: save the records of what is earned, spent, or given away later date
- Cryptocurrencies also reduce transaction costs for international payments and has value with the function of money.





Why Many Cryptocurrencies?

- Future uncertainty
- Technical differences
- Niche Usage

By Feb 2018

Total number of cryptocurrencies: 1517

Total Market Cap: \$431,350,625,513



Reference: <https://coinmarketcap.com/>

All		Coins	Tokens	USD		← Back to Top 100			
#	Name	Symbol	Market Cap	Price	Circulating Supply	Volume (24h)	% 1h	% 24h	% 7d
1	Bitcoin	BTC	\$169,953,927,760	\$10,068.10	16,880,437	\$8,343,010,000	0.64%	-6.04%	0.44%
2	Ethereum	ETH	\$79,808,218,192	\$816.22	97,778,306	\$2,199,550,000	1.20%	-3.06%	-12.65%
3	Ripple	XRP	\$36,380,774,875	\$0.932620	39,009,215,838 *	\$901,664,000	0.05%	-8.42%	-18.46%
4	Bitcoin Cash	BCH	\$20,543,150,968	\$1,209.73	16,981,600	\$476,592,000	0.58%	-8.17%	-11.88%
5	Litecoin	LTC	\$10,810,238,980	\$195.36	55,333,833	\$1,009,890,000	0.07%	-8.83%	-11.53%
6	Cardano	ADA	\$8,755,312,450	\$0.337690	25,927,070,538 *	\$215,559,000	0.46%	-8.43%	-16.72%
7	NEO	NEO	\$7,409,415,000	\$113.99	65,000,000 *	\$204,393,000	0.29%	-5.15%	-7.05%
8	Stellar	XLM	\$6,773,008,717	\$0.366747	18,467,795,830 *	\$79,806,600	0.13%	-6.82%	-19.01%
9	EOS	EOS	\$5,595,360,676	\$8.15	686,256,821 *	\$309,951,000	1.07%	-5.88%	-19.41%
10	Dash	DASH	\$4,802,536,895	\$607.92	7,899,923	\$99,038,800	0.67%	-10.81%	-12.57%
11	Monero	XMR	\$4,534,945,794	\$287.91	15,751,098	\$114,310,000	0.85%	-7.50%	0.38%
12	IOTA	MIOTA	\$4,441,411,439	\$1.60	2,779,530,283 *	\$55,728,400	0.71%	-10.35%	-23.62%
13	NEM	XEM	\$3,847,023,000	\$0.427447	8,999,999,999 *	\$28,058,700	1.11%	-9.05%	-23.86%
14	Ethereum Classic	ETC	\$3,271,127,458	\$32.70	100,045,799	\$759,572,000	0.53%	-9.93%	-5.01%
15	TRON	TRX	\$2,653,209,134	\$0.040354	65,748,192,476 *	\$170,233,000	0.52%	-8.36%	-13.38%
16	VeChain	VEN	\$2,611,756,519	\$5.46	478,484,776 *	\$66,545,900	1.32%	-6.33%	-3.56%
17	Tether	USDT	\$2,228,226,518	\$1.01	2,217,140,814 *	\$3,038,060,000	0.27%	0.43%	0.20%
18	Lisk	LSK	\$2,192,029,877	\$21.46	102,124,452 *	\$103,738,000	0.00%	-7.20%	-31.44%
19	Bitcoin Gold	BTG	\$1,947,906,791	\$115.67	16,840,499	\$33,884,500	0.45%	-6.74%	-11.72%
20	Qtum	QTUM	\$1,943,048,935	\$26.29	73,900,700 *	\$134,080,000	0.83%	-7.73%	-19.96%
21	OmiseGO	OMG	\$1,683,008,215	\$16.49	102,042,552 *	\$69,324,500	1.98%	-8.50%	4.91%
22	ICON	ICX	\$1,445,182,934	\$3.74	386,442,514 *	\$38,846,900	0.28%	-6.66%	-18.92%
23	Zcash	ZEC	\$1,330,329,351	\$398.79	3,335,931	\$72,383,400	-0.27%	-8.69%	-16.31%
24	Nano	NANO	\$1,157,236,075	\$8.68	133,248,289 *	\$125,911,000	1.47%	13.33%	-0.40%
25	Steem	STEEM	\$882,460,619	\$3.53	249,985,303 *	\$7,947,200	1.52%	-8.74%	-21.69%
26	Bytecoin	BCN	\$877,197,793	\$0.004774	183,743,670,083	\$5,118,390	0.75%	-7.25%	-17.89%



Future Uncertainty

- Bitcoin may have some catastrophic failure that the altcoins are not subject to.
- Easier way to raise money: companies can rely on cryptocurrencies to make funds
- Along with bitcoin, other altcoins can create profit



Technical Differences

- Each coin has its way of utilizing blockchain technology.
- Altcoins have some technical differences compared to Bitcoin (however they have the same utility as Bitcoin plus something else)
- Bitcoin consensus mechanism is based on Proof of Work, which is not the only consensus method. Other mechanisms such as Proof of Stake exist which is more fast and trustable.



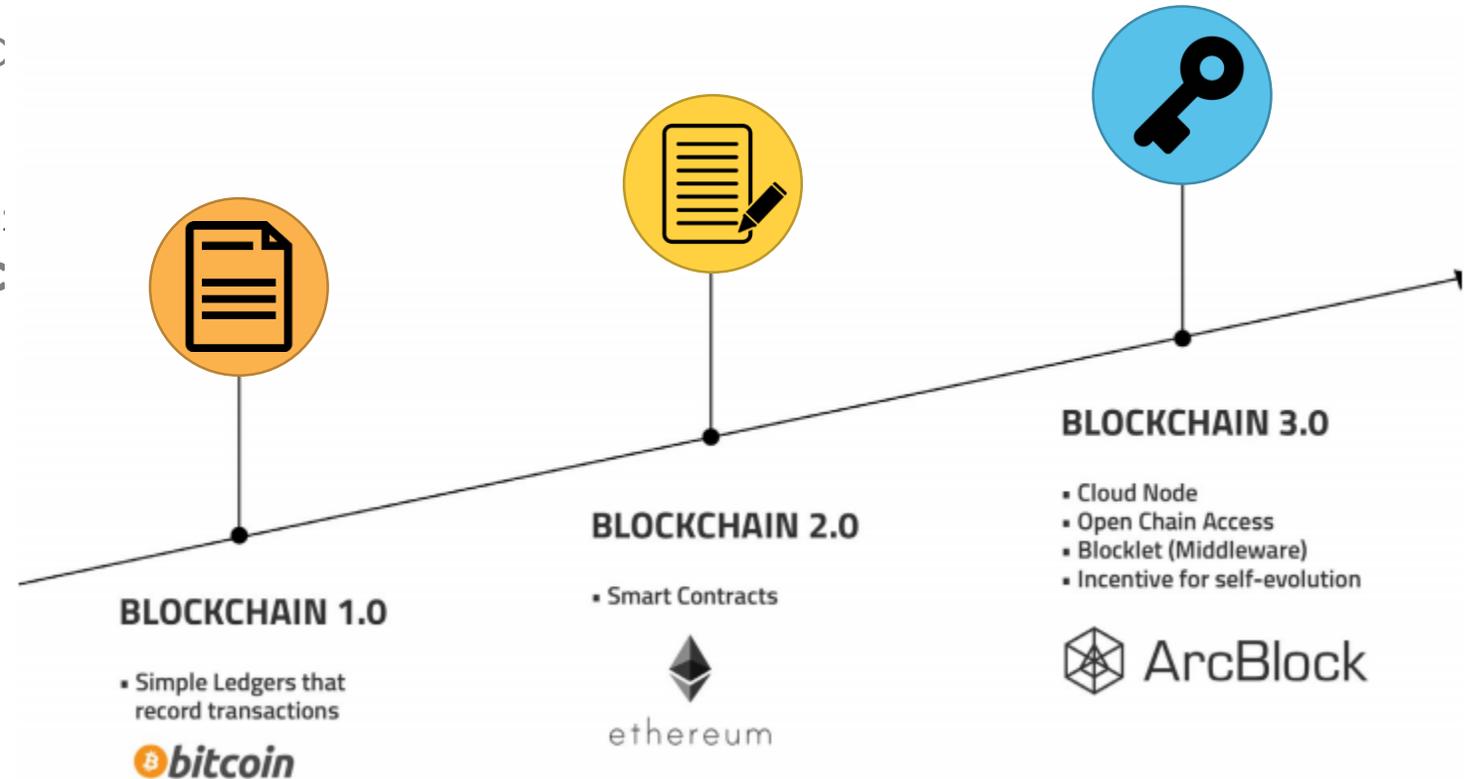
Niche Usage

- Each Altcoin has specific features which carve out niches for usage
 - Ethereum is based on a smart contract.
 - Ripple was originally conceived as a way for banks and large institutions to transfer value.
- The main advantage of Bitcoin: network effect and proven security



Future of Blockchain

- Where will blockchain go
- How to be prepared?
- How the **Internet of Things (IoT)**, **Artificial Intelligence (AI)** will solve Blockchain challenges?



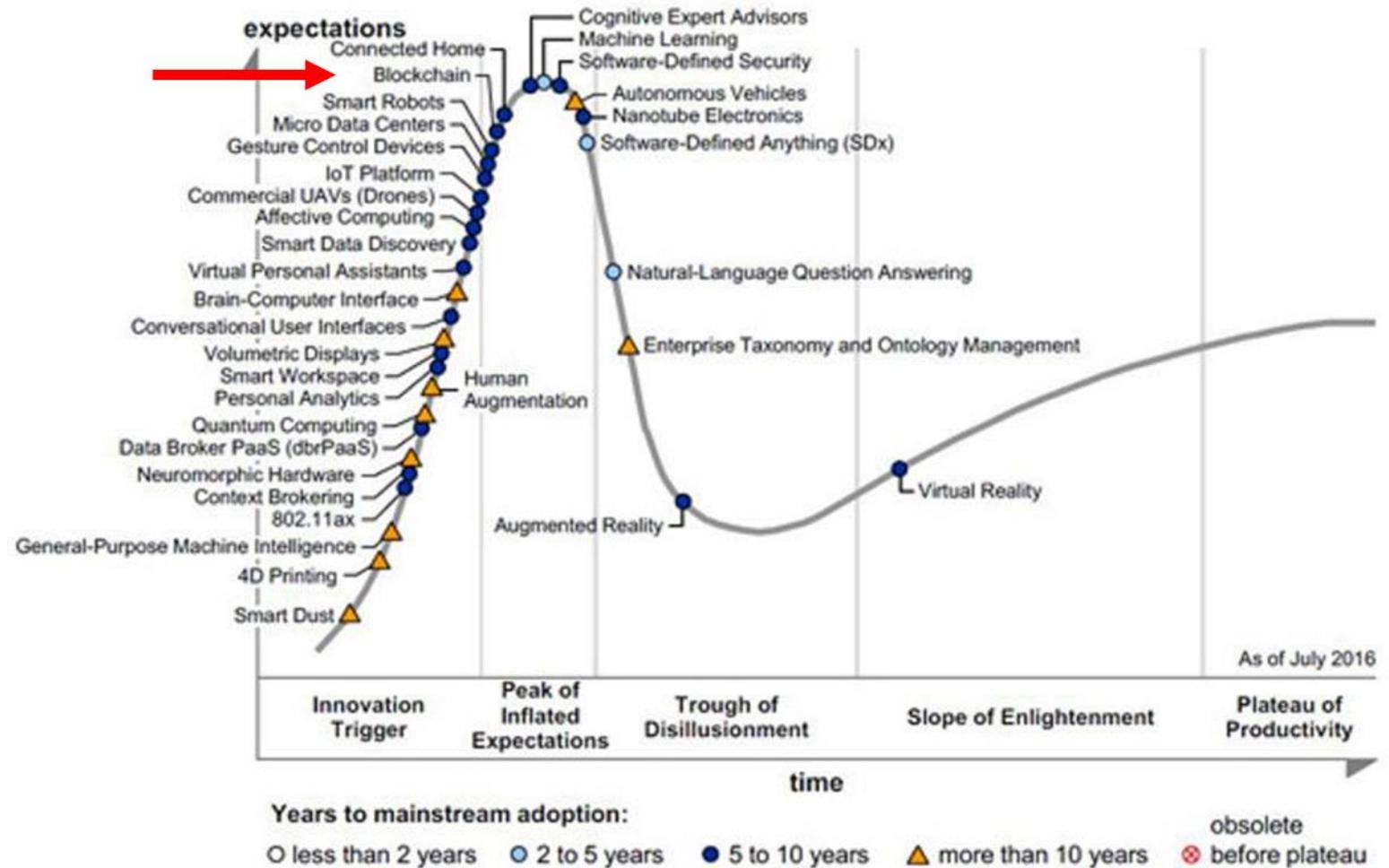


Future of Blockchain (2)

Hype cycle for emerging technologies 2016

Three trends in the Gartner Hype Cycle for Emerging Technologies, 2016:

1. Blockchain Technology
2. IoT
3. Smart Machines





Future of Blockchain (3)

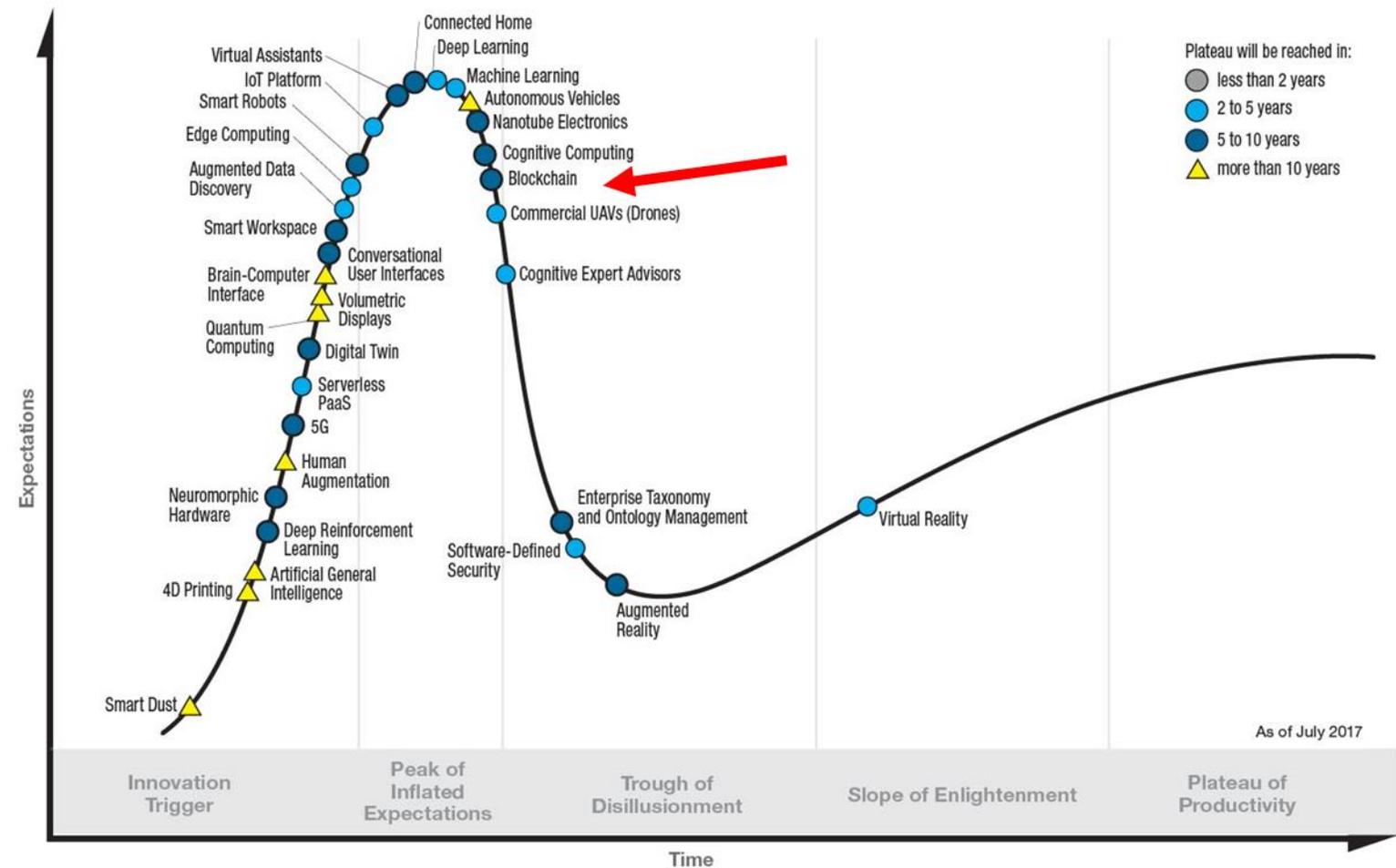
Hype cycle for emerging technologies 2017

Enterprises should explain the business potential of :

blockchain,

Artificial intelligence and

augmented reality





Blockchain as a Service

- Microsoft and IBM released private Blockchain service technologies (e.g., Azure and Bluemix). These companies will make the process of accessing Blockchain more simplified.
- Access to Blockchain technology will no longer be limited to specific parts of the world.
- Blockchain investigated as a service, not just a platform, the advancement of technologies is open to more opportunities.
- While no one has ever broken through the encryption of Blockchain technology, it still will raise doubts in people's minds to have their personal information a part of what could be seen as an experiment.





Blockchain and Smart Contracts

- Smart contracts are used in small processes; beneficial smart contracts will be on a larger scale.
- Smart contracts can easily replace lawyers for online transactions.





Smart Contracts and Blockchain Complementarity

- A Blockchain is a scattered database with an even expanding list of records, or **blocks**. These are stored on different hard drives, scattered around the world (nodes).
- The nodes are designed to make the system virtually indestructible and extremely secure.





Solidity and Smart Contracts

- Most smart contracts today are done with the aid of the **Ethereum** platform which is a public platform that makes a virtually decentralized machine
- Solidity is **Object Oriented** and, it resembles JavaScript.
- Solidity supports **structures, enumerations, and byte** arrays that can hold data of any type.
- Solidity supports **mappings** which are in essence key-value stores that map keys of any data type to values of any data type as well.





Contracting Parties

Smart contracts legally find contracting parties:

- It makes the **automation** of small processes possible
- The **digital signature** attached to every transaction can be enough proof that the contracting parties agreed to enter into an arrangement
- **Businesses** are those benefit from smart contracts
- Smart contracts can **conceal** data although, at the present moment, there are several efforts to make sections of the Blockchain undecipherable to others.





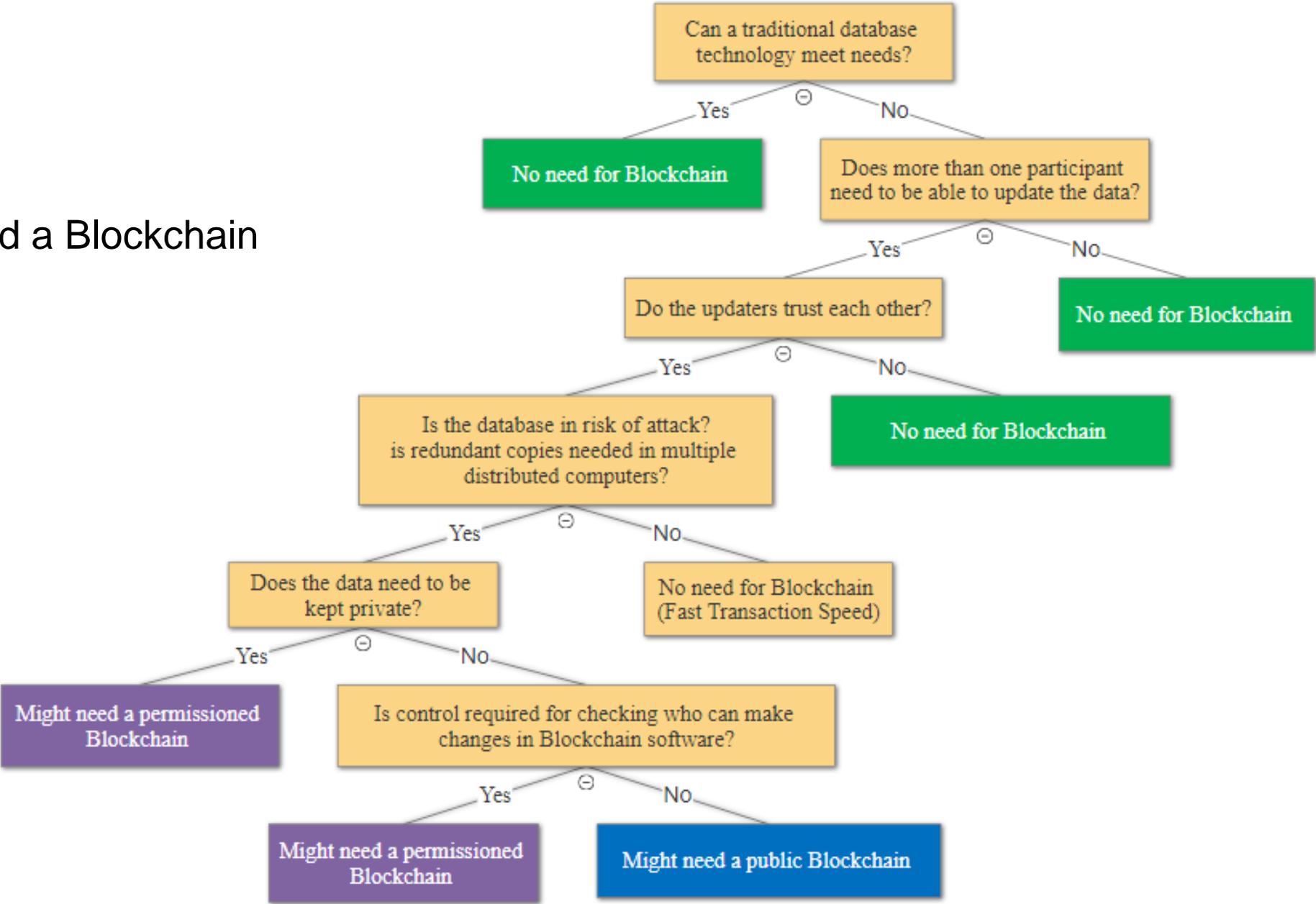
Types of Smart Contracts

- Financial Services
- Property law
- Credit enforcement
- Breach prevention
- Double deposit method
- Oracle contracts



Decision Tree

- The business need a Blockchain Technology?!





Blockchain Applications by Sector

Economics and Markets

- Currency
- Payments
- Banking
- Clearing & settlement
- Insurance
- FinTech
- Trading
- QA & Internal Audit
- Crowdfunding

Government and Legal

- Transnational orgs
- Personalized governance services
- Voting
- P2P bonds
- Tele-attorney services
- IP registration and exchange
- Tax receipts
- Notary service

Internet of Things

- Agricultural networks
- Smarthome networks
- Integrated Smartcity
- Self-driving car
- Personalized robots
- Personalized drones
- Digital assistants

Health

- Universed EMR
- Health databanks
- QS data commons
- Big health data stream analytics
- Digital health wallet
- Smart property
- Health token
- Personal development contracts

Science, Art, AI

- Community supercomputing
- Crowd analysis
- P2P resourcenets
- Film, dataviz
- AI: Blockchain advocates, digital mindfile services



Economic & Market Application

Blockchain has numerous applications in the finance industry:

- Currency
- Insurance
- Post-trade settlement
- Financial crime prevention





Blockchain in Finance

Blockchain provides opportunity in the financial system to increase operational efficiency by

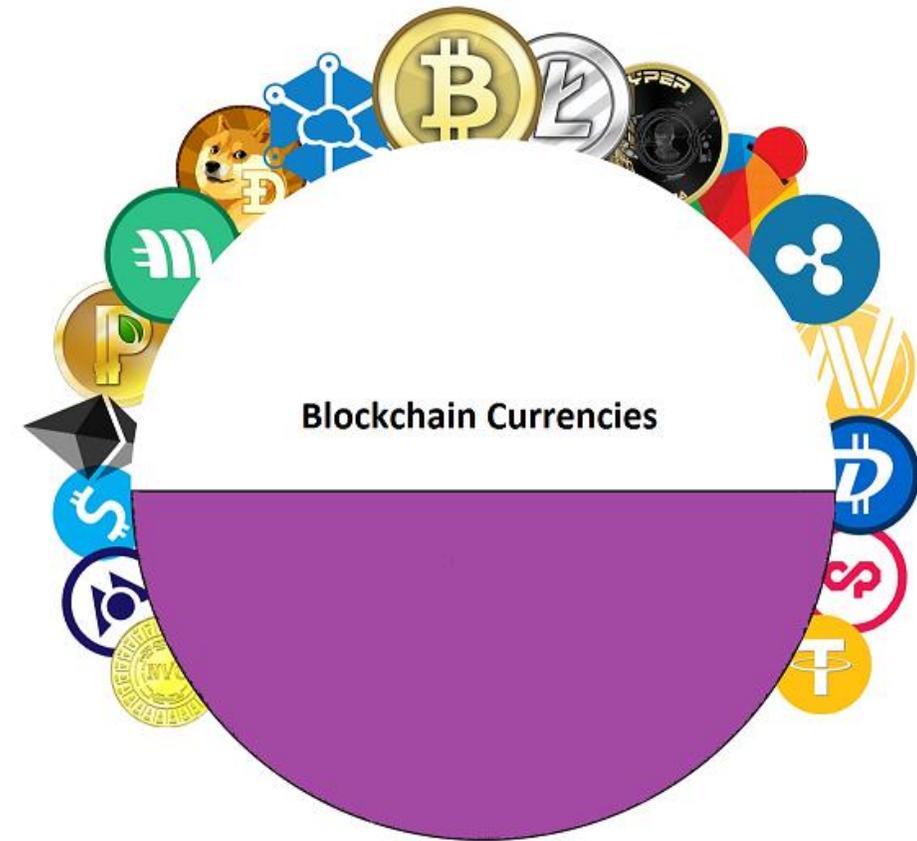
- Condense transaction time
- Remove manual processes
- Reduce frictions, digital identities and cross-border payments.
- Reduce the cost and complexity of financial activities
- Reduce errors, misinterpretations, disputes, and fraud





Blockchain Currencies

- An innovative network of payment and a new type of money
- Fast peer-to-peer transactions
- Worldwide payments
- Low fees for processing





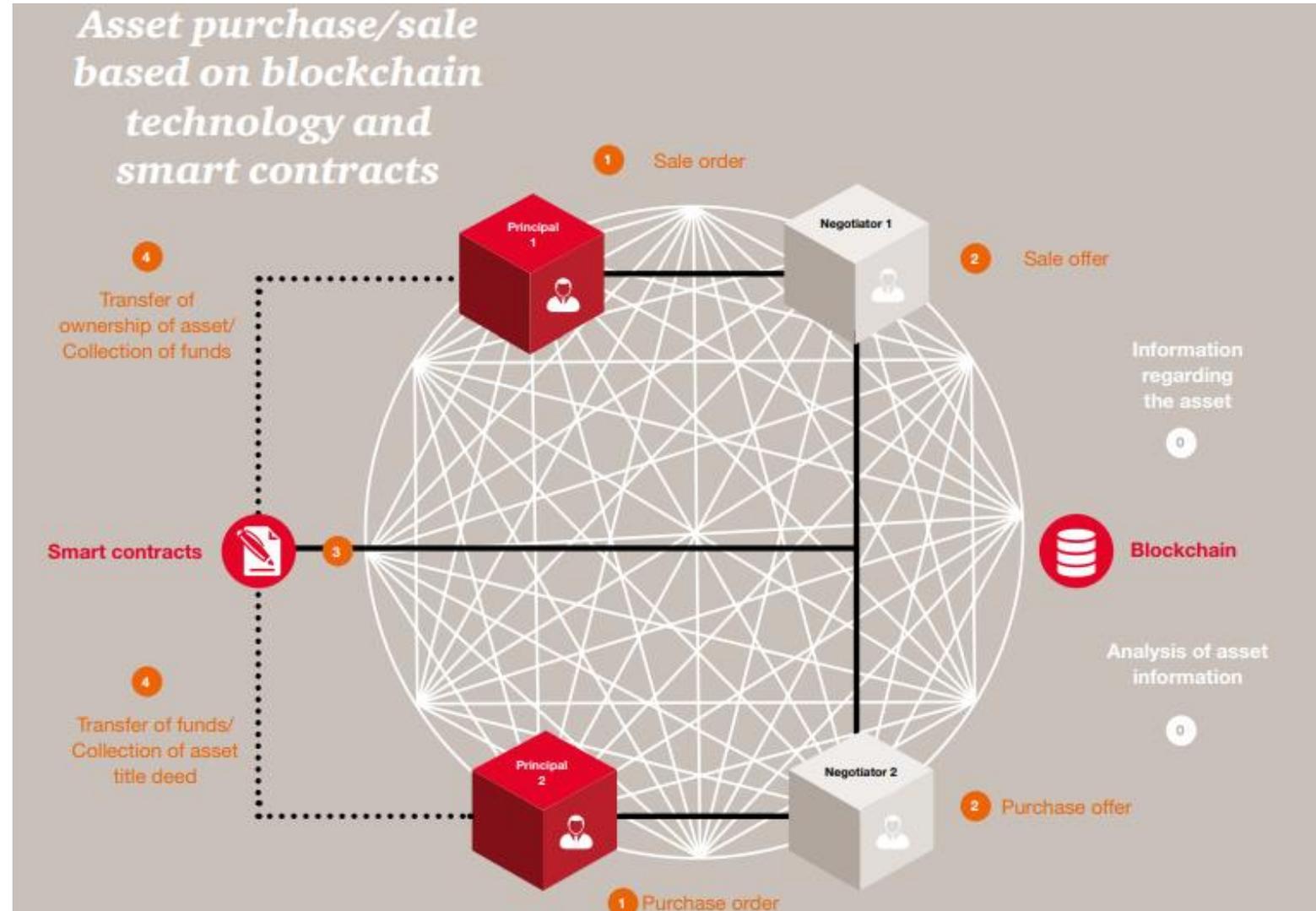
Blockchain and Insurance

- Insurance claims are a hassle and annoy to be correctly completed and have all parties participating. Applying Blockchain removes all these steps, and the process is greatly **simplified**.
- Proof of insurance procedures will be **instantane** than taking weeks to process due to the avai Blockchain to store and transmit this information parties instantaneously (change wording).
- The **cloud** in smart contracts eliminate the need insurance steps and remove the chance get amount agreed by the insurance company.





Possible change in the asset purchase/sale process





Blockchain and Reinsurance

When multiple insurance companies share risk by purchasing insurance policies from other insurers to limit the total loss the original insurer would experience in case of disaster is called reinsurance.

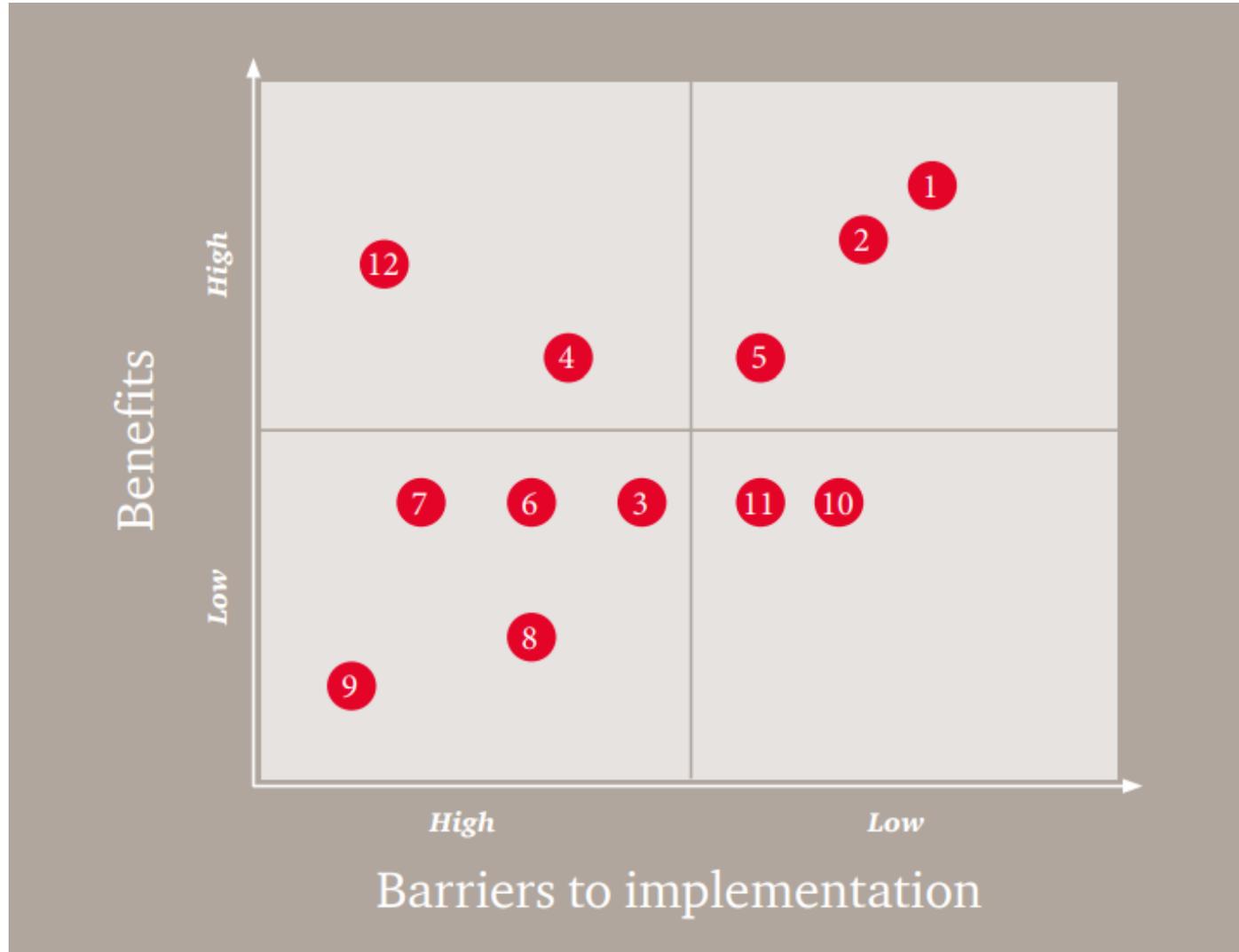
The benefits of blockchain within reinsurance:

- More **accurate** reserve calculations based on all participating contracts
- **Automatic** calculation updates once underlying updated.
- Insurers gain more **flexibility** in moving capital and enhanced transparency into known risks, capital and capital requirements for compliance.
- Audit trails become **easier** to follow, modeling requirements are greatly reduced, and there is less need for coordination between finance and IT.





Blockchain Taxonomy in Insurance System



1	Contracting documentation	7	Sensitive data management
2		8	
3	Claims management	9	Management of exposure in real time
4		10	
5	Contract eligibility	11	Guarantee management
6	Multi-national insurance policy	12	Excess of loss reinsurance
	KYC/AML*		Personal data management
	Inter-firm accounting		Emerging market



Blockchain and Real Estate

- Instead of checking credit scores, verify incomes and sift through paperwork Blockchain **automate** the entire process.
- **Sensors** can be placed to detect a person is a match for property and automatically handle all the steps
- Reduce **fraud** between lenders and home buyers.
- The process would be **transparent** with all the information.



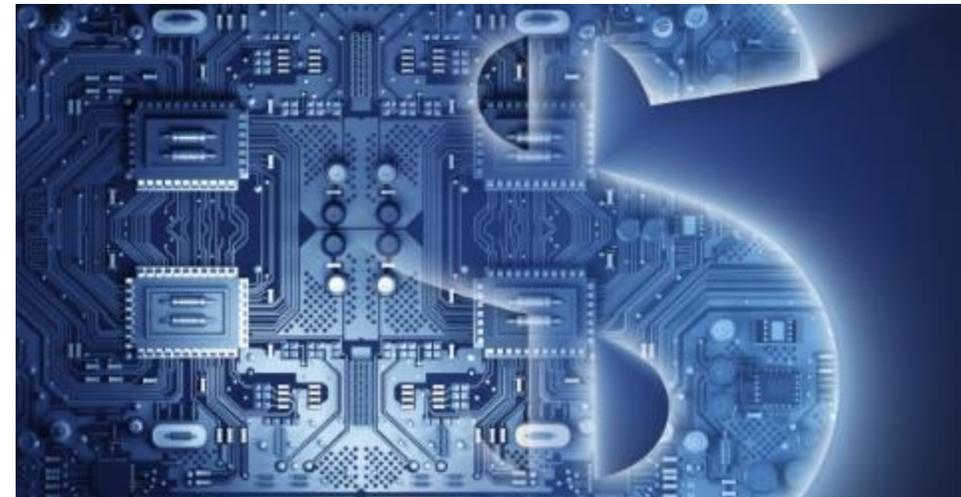


Financial Crime Prevention

- Due to the immutable, shared, and transparent nature of Blockchain, regulators, can easily be granted **access** to a private blockchain where they can fetch data for relevant regulatory reporting.
- Reducing **complexity** and **costs** related to the current regulatory
- Blockchain can provide a **single** shared view of all financial transactions in the system that are cryptographically secure, authentic, and auditable

The key enablers to prevent financial crime:

- Know the customer (KYC)
- Anti Money laundering (AML)

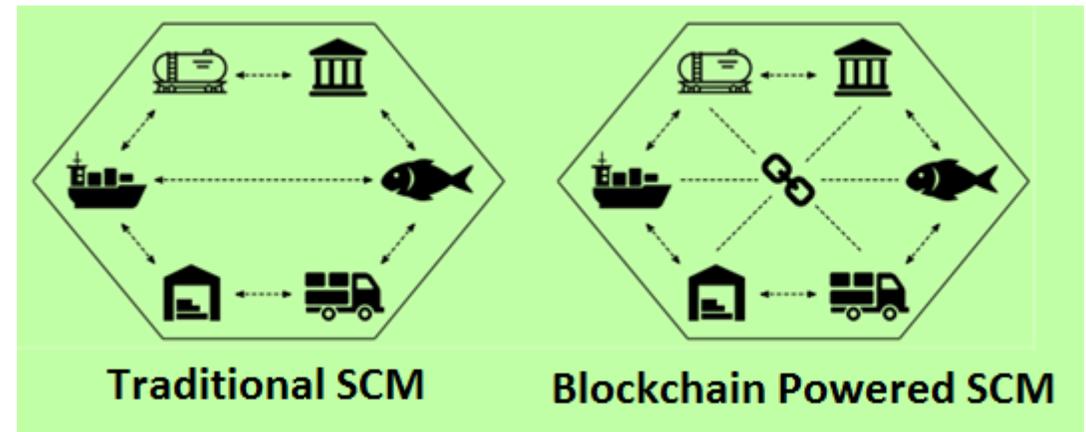




Supply Chain

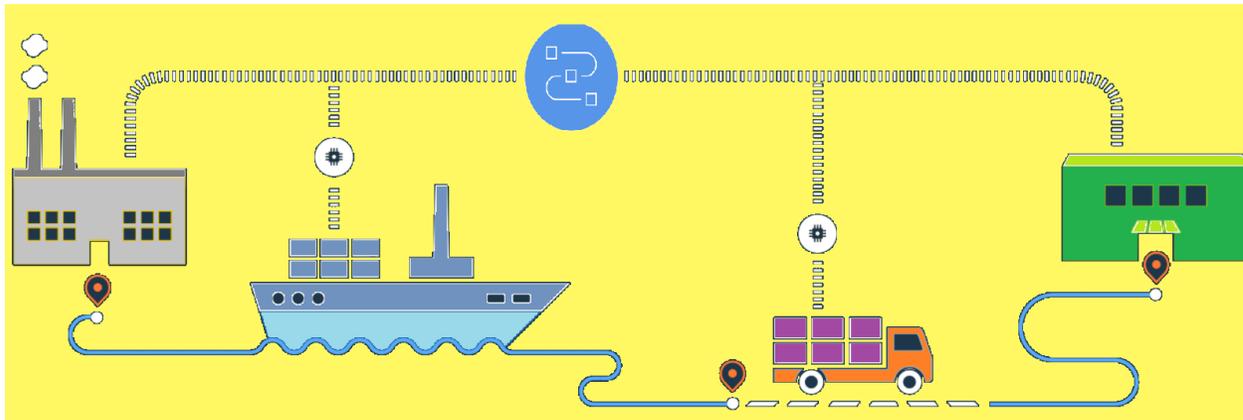
To improve issues regarding SCM Blockchain technology has been applied by several companies:

- The **consensus** options allow for a wide range of flexibility on many nodes taking part in the consensus process and having a trusted database
- Provide a clear **audit trail** for stakeholders
- Provide more **transparency** in the product supply chain.





Blockchain and Supply Chain



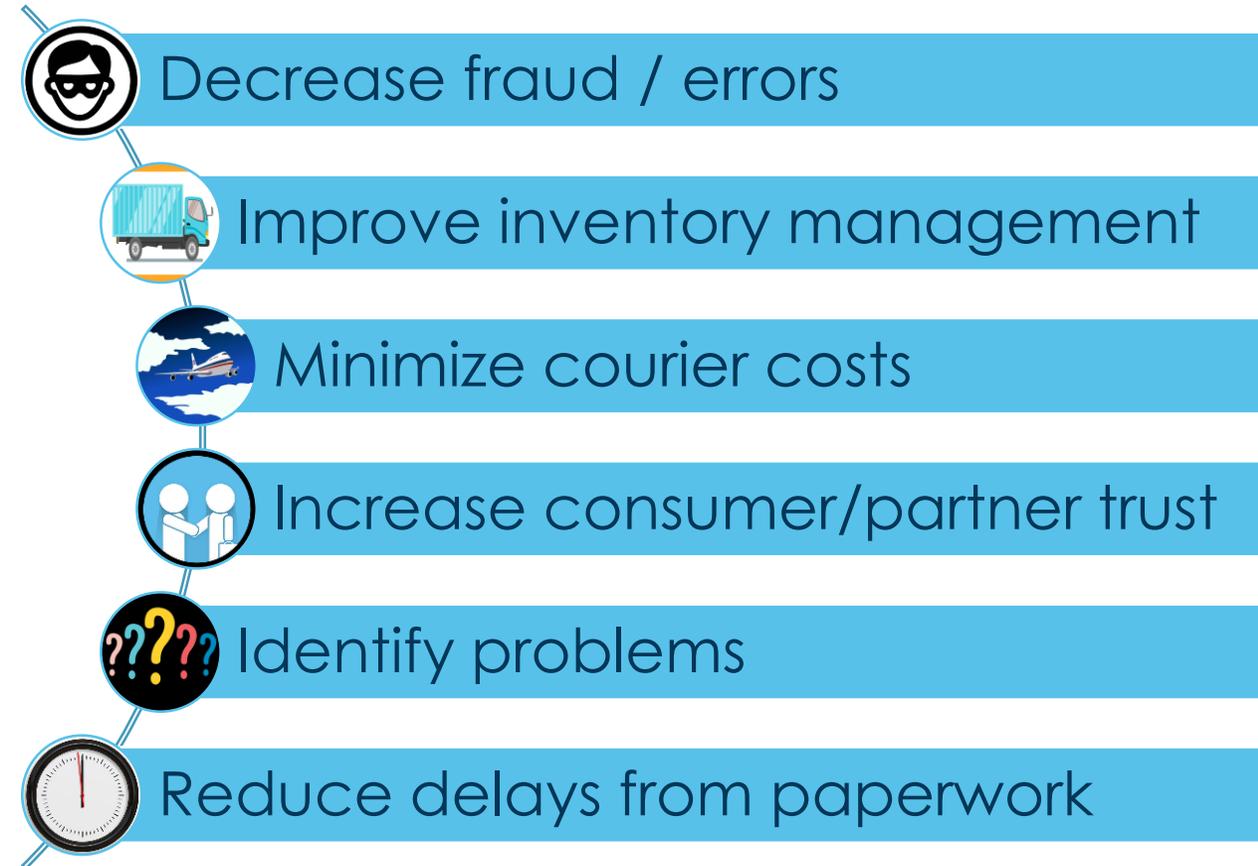
Watch “Cross-border supply chain solution on blockchain” video here:

<https://www.youtube.com/watch?v=tdhpYQCWnCw>

- With the ability to provide continuity in information sharing, Blockchain and IoT capabilities can significantly help global businesses mitigate their operational risks by ensuring **temper-proof** and **reliable** consecutive flows.
- **Document** all the transactions.
- Create a permanent **history** of a product, manufacture to sale
- Reduce time delays, added costs, human errors

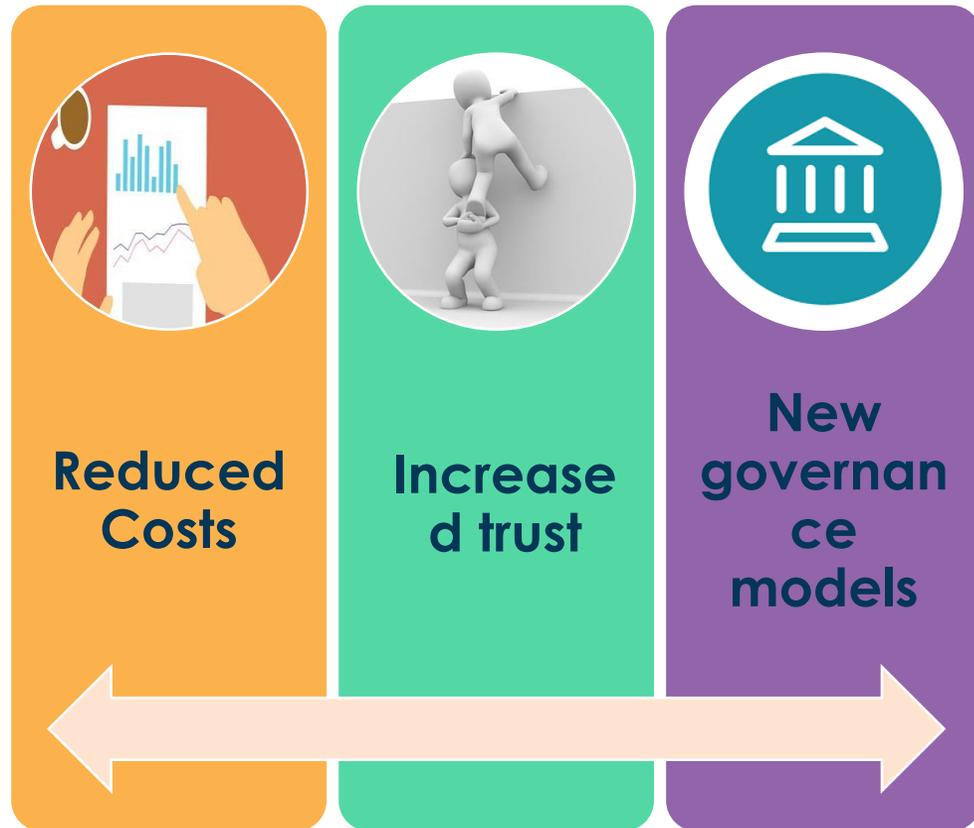


Benefits of Blockchain in Supply Chain





Charity and Blockchain



- Every unit is unique on Blockchain and cannot be substituted by another equal value. Therefore, donations can have **radical transparency** all the way through a charity to the end beneficiary.
- Blockchain/cryptocurrency can provide a means of getting money for Non-Governmental Organizations (NGO) operating in **challenging locations** that infrastructure lacking or corruption rife.
- **Intangible assets** can all be recorded on Blockchain.
- Automation of **micropayments** would be easier through Blockchain.



Government & Legal Application

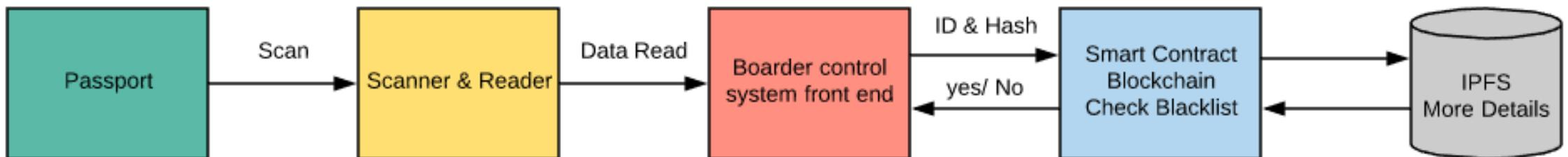
- E-government or electronic government is a paradigm in which information and communication technology is used to deliver public services to citizens.
- Transparency, auditability, and integrity are attributes of Blockchain that can go a long way in effectively managing various government functions.





Border Control

- One of the current border control systems concerns is **centralization** and the fact that data is not shared between law enforcement agencies. Tracking suspected individuals are difficult.
 - Another issue is related to the immediate implementation of **blacklisting** of a travel document or revokes a suspected passport.
-
- Blockchain can provide a solution to this problem by maintaining a blacklist in a smart contract which can be **updated as required** and any changes will be immediately **visible to all agencies** and border control points thus enabling **immediate control** over the movement of a suspected travel document.





Blockchain for Identification

- Legacy systems, improper data management, inefficient verification processes, internal systems exposed to malware, and faulty third-party applications make it too easy for a sophisticated hacker to access personal information.



Blockchain can be used for identity management.

The app can be used with smartphones like a virtual ID card.

The government agency can act as a trusted authentication authority.

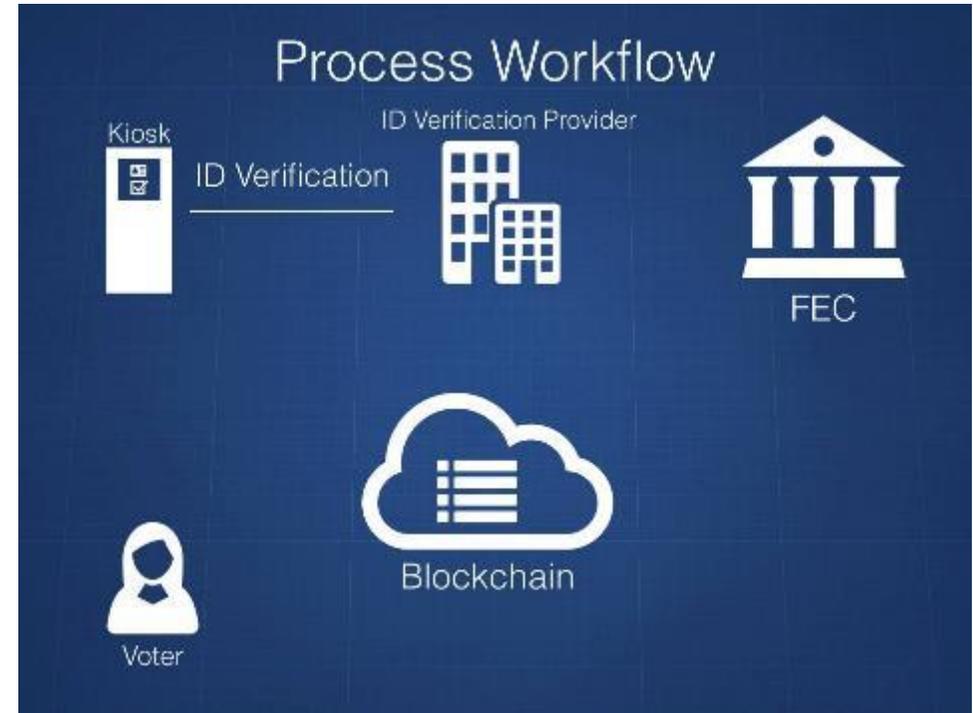
The current use cases are:

- Civic App
- SecureKey and IBM
- MONI
- E-Stonia



Blockchain-Based Voting Systems

- The Blockchain-based voting system provides greater **transparency** into the voting process, with every vote being recorded on the Blockchain
- Each vote is recorded below a **secure**, cryptographic hash which appears as a major technological breakthrough
- This kind of voting system was first employed by a Danish political party



 Watch "Voting on the Blockchain" video here:
<https://www.youtube.com/watch?v=hh3U0i0OH>
Rs



Blockchain Voting Example

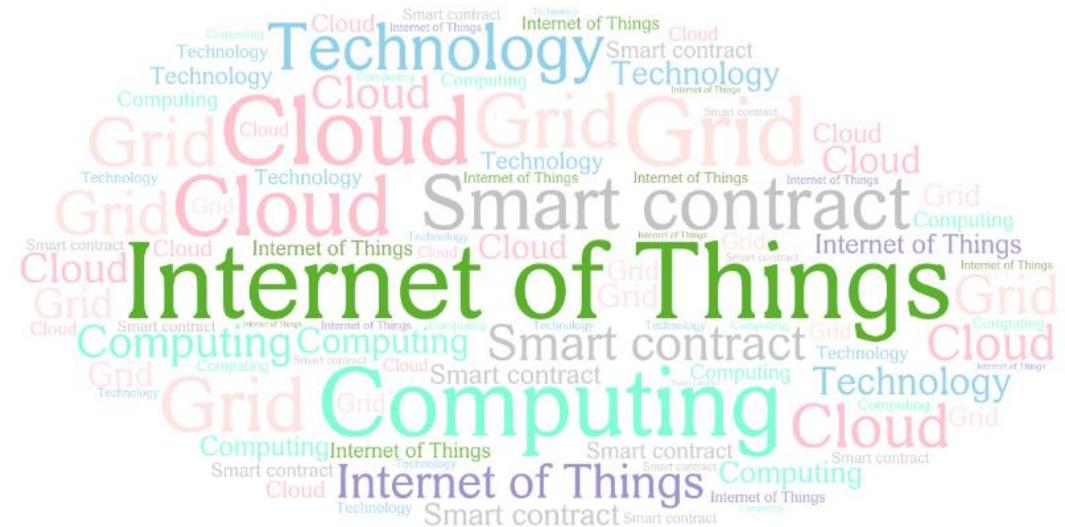
- The world's first Blockchain-powered election happened in Sierra Leone on March 07-2018.
- 70% of the votes were recorded through Blockchain (Swiss-based Blockchain technology company **Agora**)
- The votes were anonymously stored in an immutable ledger





Internet of Things (IoT) Definition

“A dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable where physical and virtual “things” have identities, physical attributes, and virtual personalities and use intelligent interfaces, and are seamlessly integrated into the information network, often communicate data associated with users and their environments.” (Smith, 2012)

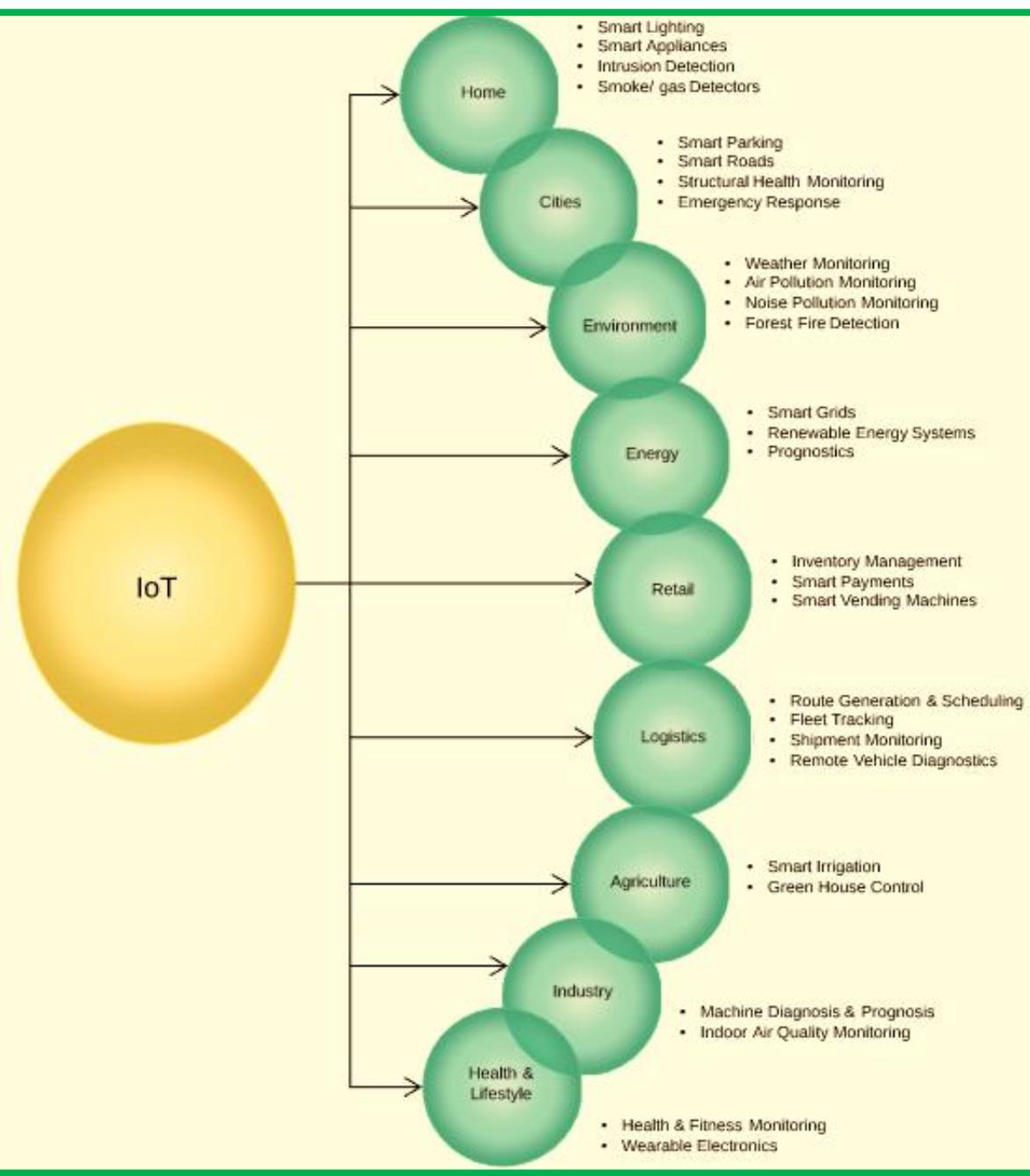




IoT

- IoT allows communication and data exchange while executing meaningful applications towards a common user or machine goal.







Health Application

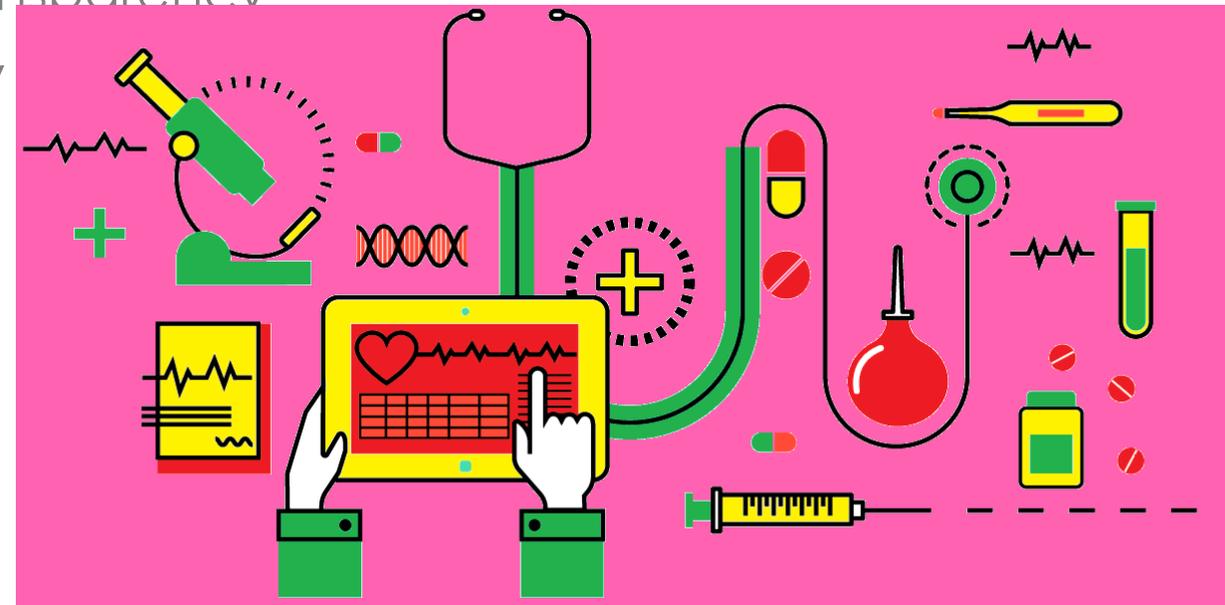
Major issues in health care systems

- Privacy compromises
- Data breaches
- High costs
- Fraud

They are caused by:

- Lack of interoperability
- Overly complex processes
- Lack of Transparency
- Auditability
- Control

The **counterfeit** medicines is an important issue especially in developing countries.





Healthcare and Blockchain

With the adaptability of Blockchain, numerous benefits can be obtained including:

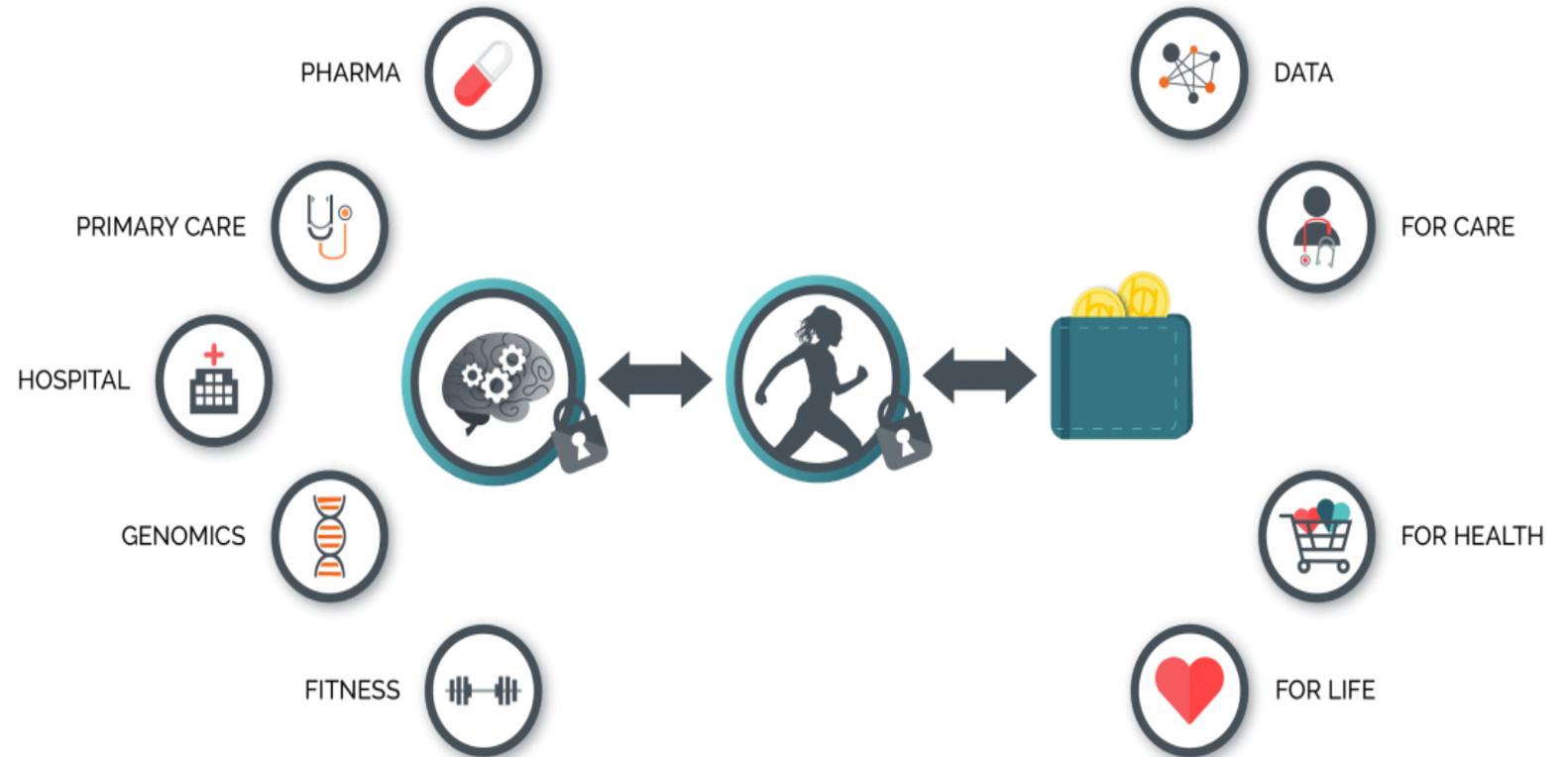
- Cost saving
- Increased trust
- Faster processing of claims
- High availability
- No operational errors due to complexity in the operational procedures
- Preventing the distribution of counterfeit medicines.





Applications of Healthcare Blockchain

- Data Sharing
- Data Security
- Data Privacy





Art and Blockchain

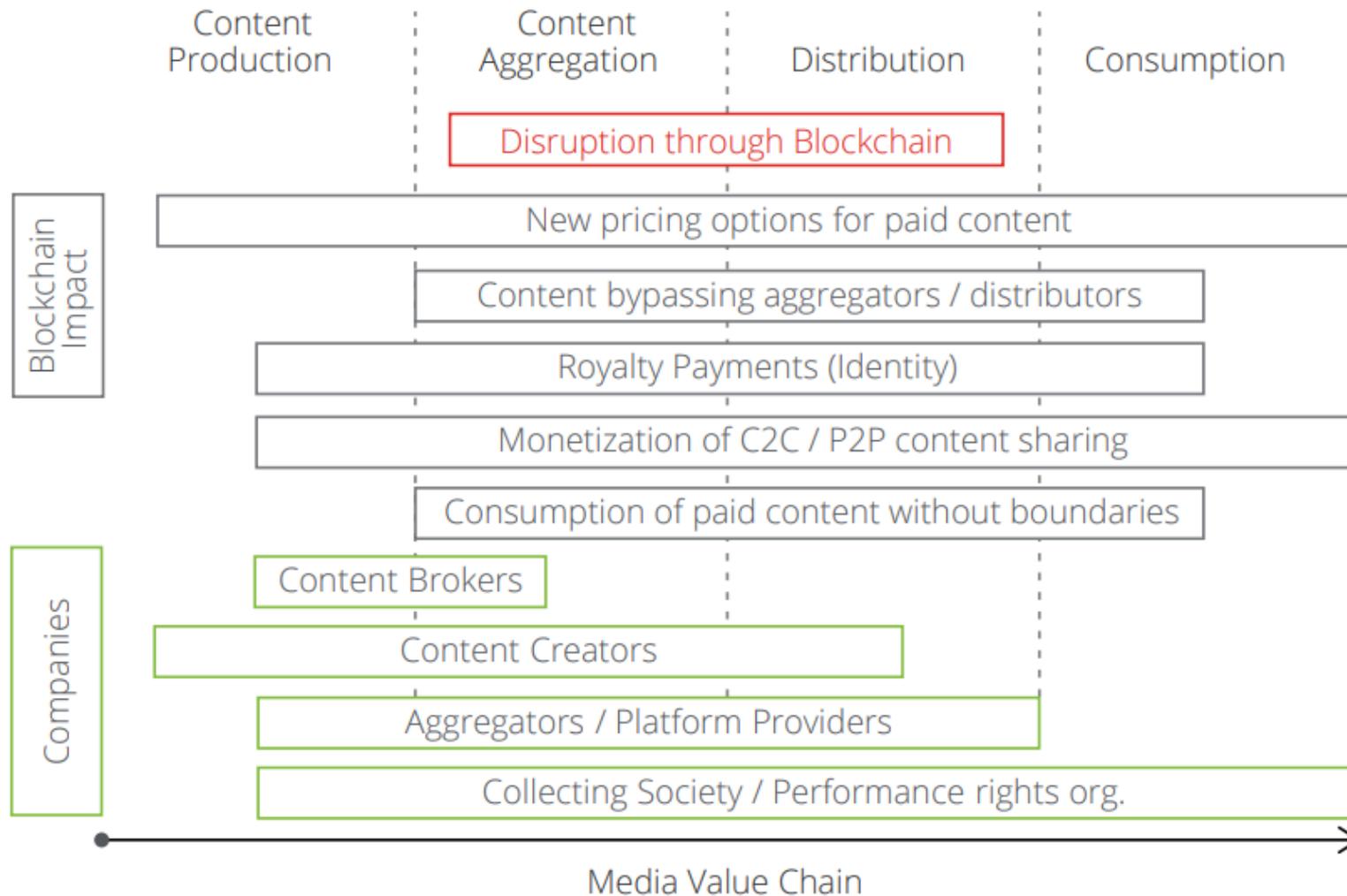
Media

- **Proof** of publication that allows a copyright owner to publish and monetize a piece of content is a service provided by Blockchain.
- Blockchain also can be used for ensuring the **accuracy** of news.
- Blockchain offers solutions for **compliance** with data regulations.





Blockchain Primary Relevance in the Media Chain Value





Blockchain-Based Opportunities in Media

Upcoming Media Opportunities from Blockchain

Focus area

New pricing options for paid content



Description

As micro-payments become economically efficient and digital content is harder to copy illegally, new pricing opportunities arise

Benefits

- Low-price content (<1€) can efficiently be settled between seller and buyer

Content bypassing aggregators/distributors



Blockchain allows everybody to become a marketer as reach of lead generation becomes trackable and can be compensated

- Liberalization of advertising market
- More precise performance tracking of advertising efforts

Distribution of Royalty Payments



Content consumption / usage is captured in Blockchain and a precise consumption-based analysis of playtimes is possible

- Near real-time allocation of royalty payments
- Alternative to imprecise estimates

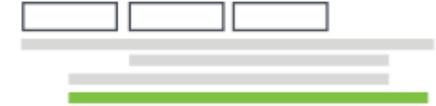
Monetization of C2C / P2P content sharing



C2C / P2P content sharing and usage becomes transparent and monetizable through the Blockchain

- Transparent and "controllable" P2P transactions Automated "real-time" billing
- Automated "real-time" billing

Consumption of paid content without boundaries



National / regional limitations of paid content subscriptions and DRM complexities will be decreased by the Blockchain

- Decreased complexity of rights management
- Direct linkage of consumption to individual / user through Blockchain authentication



Key Notes for Media Players

Items should be considered by the media players using Blockchain Technology:

Micro payment for content creators

Distributors consider paying artist in smaller tranches

If artists market themselves, they charge consumers directly

Enabling a bypass of aggregators

Monetization of low price content is getting feasible due to very low transaction costs

Allow consumers to choose "ad free" content at small prices

Smart Contracts

Reengineering contractual relationships in a smarter and more transparent way

Enable immediate transactions and automated royalty/revenue share distribution

Decrease DRM and billing complexities

Increase customer experience through multi-country access of paid content

Decrease DRM* complexity

Enable real-time billing for all transactions



Blockchain and Fine Art

- The art industry is dependent on the provenance and authenticity of artworks.
- Blockchain can be used to prove the piece's previous owners.
- Blockchain can be used as a means of acquiring art to make tangible objects easily tradable and exchangeable from anywhere in the world, without the need to physically transfer them from secure storage.

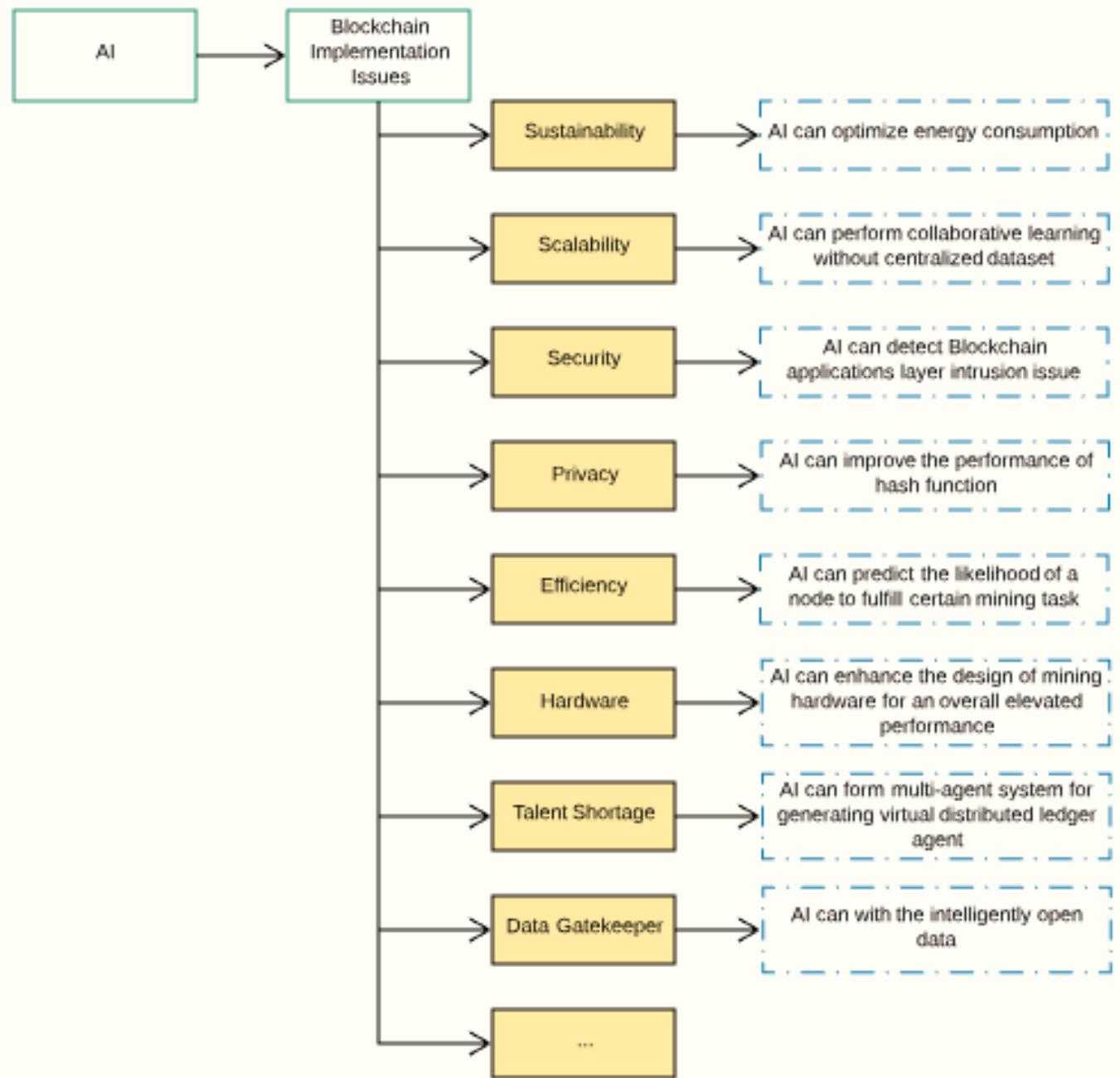


Blockchain in Fine Art



Blockchain and AI

- Artificial Intelligence (AI) is intelligence that is artificially made.
- AI can help in Blockchain implementation.
- The figure illustrates synthesizing AI and Blockchain.





Public Utilities and Blockchain

- The utility sector is transforming. Countries, companies, and municipalities are applying Blockchain technology to stay ahead of the curve.
- Blockchain can provide data security and system transparency to the energy ecosystem.
- A distributed ledger can provide the possibility of facilitating machine-to-machine, smart contract based interactions.





Blockchain for Public Utilities

- Chile's national energy regulation organization has launched a project based on the Ethereum Blockchain network to record data from the nation's energy sector.
- Energy data is stored on a database distributed on many servers which will provide public access to real-time information.
- After verification of the generated energy data, records will be added to the Ethereum network.





Blockchain and Energy

- One of the biggest challenges facing the energy industry, companies in the habit of trading surplus supply need infallible record keeping.
- Tracking energy allocations in real time, and ensuring efficient distribution through the supply chain requires multiple data points, and also mandates close cooperation between all entities.
- Blockchain technology has the potential to radically change energy as we know it, by starting with individual sectors first but ultimately transforming the entire energy market.





Blockchain in Energy Sector

Overview of possible Blockchain use cases in the energy sector

Applications with a focus on transactions and smart contracts (automated execution of transactions)

Decentralised energy transaction and supply system

- Decentralised buying/selling of energy (primarily electricity)
- Special opportunities and use cases for prosumers
- No supplier-switching process
- Cryptocurrency integration

Other smart contract applications, e.g. in the fields of electric mobility, smart devices

Applications with a focus on documentation of ownership

Register recording ownership and current state of assets (asset mgmt.)

Guarantees of origin, certification of renewable energy

Guarantees of origin, certification of emission allowances

Applications with a focus on distributed transaction records

Metering and billing of electricity consumption

Metering and billing of heat use

Billing of electric mobility ("roaming")

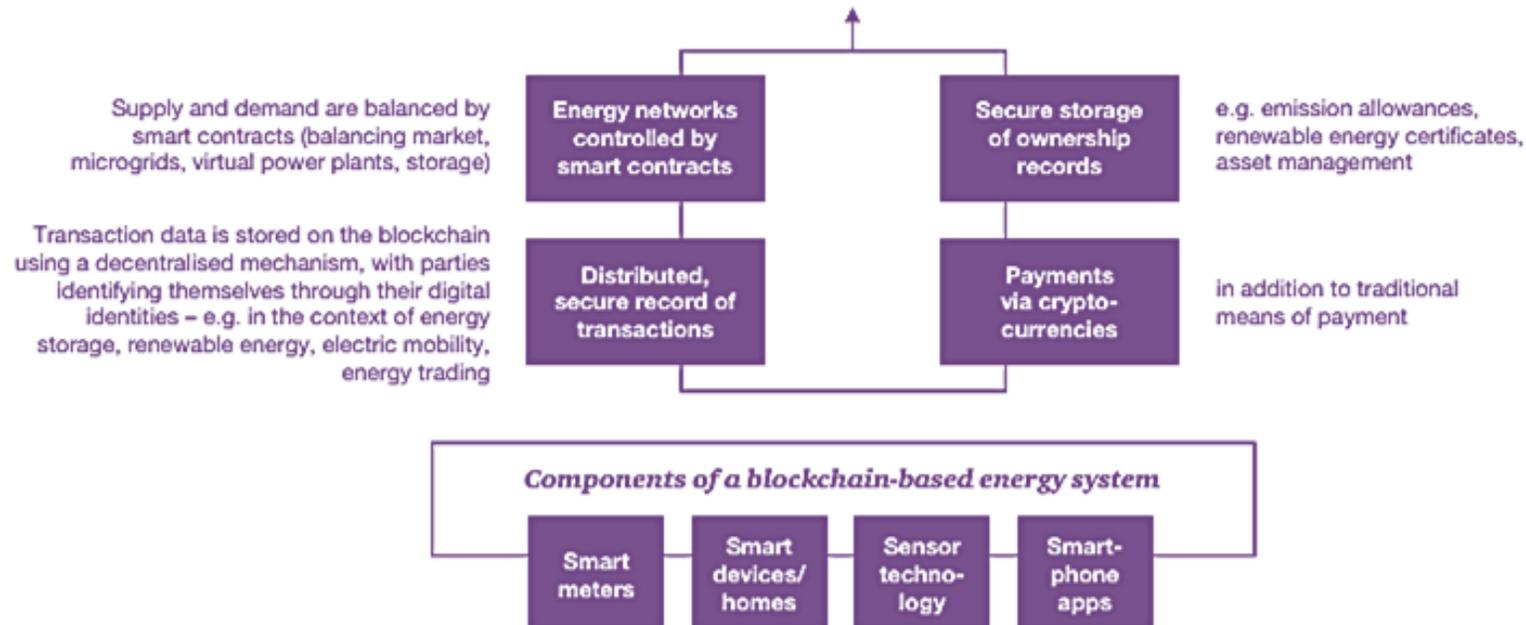


Decentralized Energy System

Cornerstones of a decentralized energy- transaction and supply system

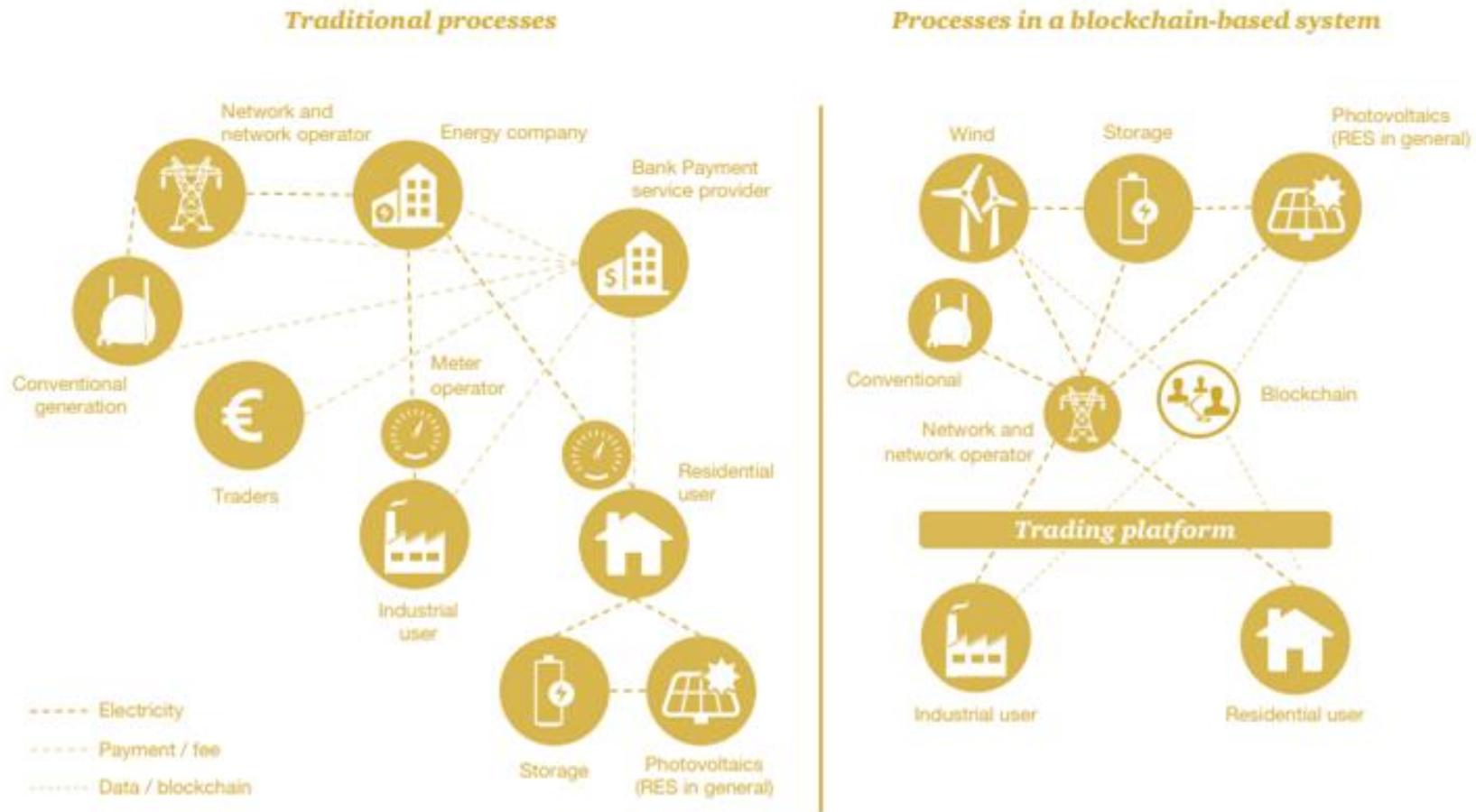
Decentralised energy transaction and supply system

- Transactions (consumer-producer matching) are effected either fully automatically (based on smart contracts) or manually (e.g. Brooklyn)
- Transactions are recorded on a blockchain in a tamper-proof way
- Energy is delivered via the network (e.g. power grid)





Transformation of market structures on introduction of decentralized transaction model





Blockchain in Energy System

- There is some test projects developing with some major energy suppliers to help them track the distribution of resources in real time while maintaining data confidentiality at all times.





Blockchain and Space

1. Utilize space to serve business and consumer needs better.
2. Enhance access to space industry and technologies.
3. Accelerate the process of discovering and using space.





Smart Cities

- A smart city integrates information and communication technologies to improve the quality and performance of urban services, including energy, transportation, and utilities, to reduce resource consumption, wastage and overall costs.
- The overarching goal of a smart city is to enhance the life quality for citizens through smart technology.





Blockchain-based Smart Cities

- The open ledger of blockchain and smart contracts can be used to prove residency, age, and identity that are backed by a trusted authority in a smart city.
- It can create a smart city platform that focuses on “giving power back to the people” via a distributed platform that is under community control.

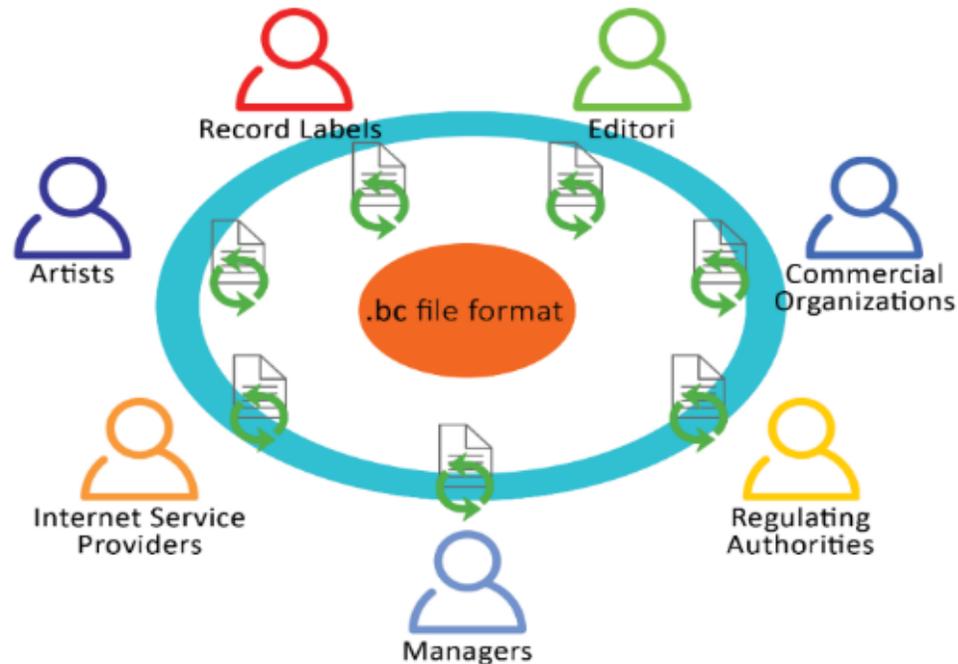




Blockchain: An Alternative Structure for the Global Music Industry



A System-of-systems Based Online Architecture



- An open online architecture structure based on system-of-systems models is proposed upon a blockchain system.
- All information in a Blockchain system is replicated and synchronized on distributed networks, using link bridges called "plugins".
- These offer each type of actor in the music industry to communicate with the Blockchain technology through the system-of-systems' common ".bc" digital online format, as shown in the Figure.



The "Trust" of users in Blockchain

- Trust in technology has always been viewed with some skepticism by society until it has been scientifically demonstrated.
- Social platforms such as Facebook and Twitter use a simple concept called "*Tagging*", based on the principles of **APPROVE**, **IGNORE**, and **DENIAL**.
- The Facebook platform has introduced the person tagging model in a digital photo or video, posted by a user, represented in the Figure.





Trust in Music Industry

- This analogy contributes to the way “Trust” is built into a public ledger because once people have tagged themselves on digital content such as photos, music or video content, and they have approved "marking", a new version of the "Truth" is reproduced through this content:
 - **APPROVE OF "MARKING" = TRUE**
 - **IGNORE OF "MARKING" NEARBY = TRUE**
 - **DENIAL OF "MARKING" = DISPUTE**
- All these "Trust" states are intended to be solved and ultimately lead to "Truth", such as the "Tagging" and "Pending" models represented in Figure 4.

The image shows a digital profile for the band Suede. It is divided into three main vertical sections. The left section features a black and white photo of the band members at the top, followed by the artist name 'Suede' and statistics: 251 tracks, 30 albums/singles, and a list of current members including Brett Anderson, Neil Codling, Simon Gilbert, Richard Oakes, and Mat Osman. The middle section is titled 'SONG' and lists 'So Young' with regional identities (The London Suede, USA), primary residence (England), primary email contact (suedetheband@example.com), manager (Walter Rogers), business manager (Jacqueline Cox), music licensing contact (Teresa Grant), IPI # (I-000000229-7), and method of payment (PayPal). The right section, titled 'VERIFYING ORGS', shows verification status for various organizations: LABEL (with a logo), PUBLISHER (with a logo), PRO (BMI), LICENSING (with a 'Contact' button), SPOTIFY (Pending...), TWITTER (with a logo), and FACEBOOK (Pending...).



Economics in Music Industry

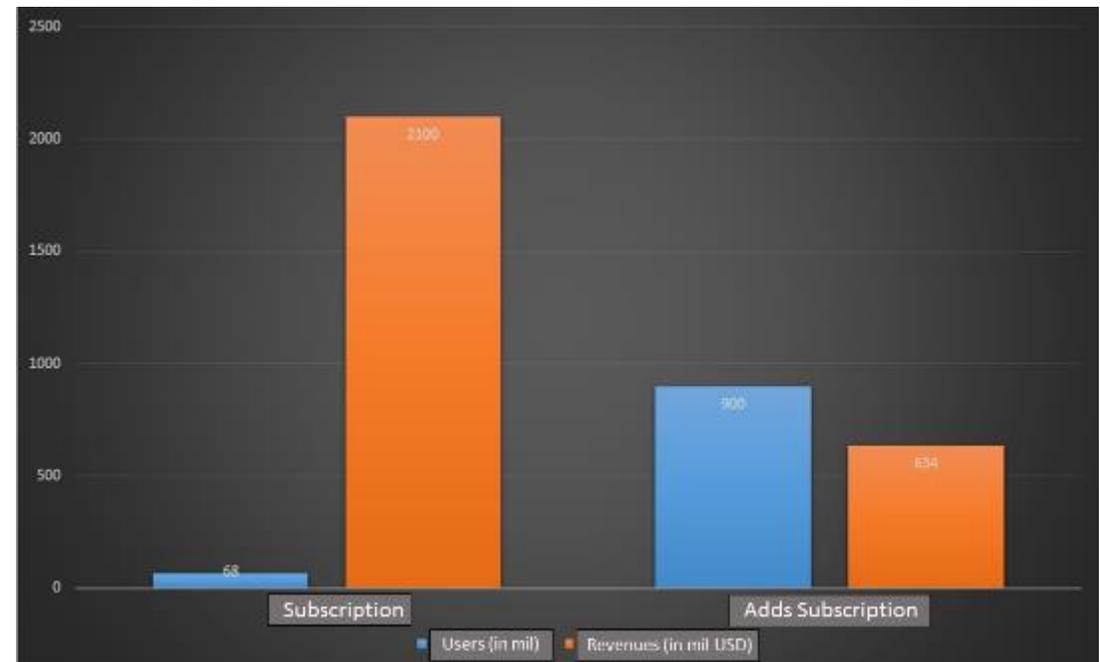
- Users versus revenue from "payment subscriptions" and "advertising payments".
 - This model offers many companies the ability to reach the goal of a business, capturing as many customers as possible.
 - The benefits brought by this model are favorable when there is a considerable audience on an online platform, and companies are willing to pay for it to access with personalized advertisements.
 - The table below describes the revenue generated by the "subscriptions" model and the "advertising subscriptions" model and the number of users in 2016 from the global online music industry.
 - The revenue measurement unit is set in millions of users and millions of USD.

	Users (millions)	Revenues (millions USD)
Subscriptions	68	2100
Advertising subscriptions	900	634



Economics in Music Industry: the Advent of Blockchain

- The graphical representation in the figure shows the existence of a market value difference between "subscription" model users and those using "advertising subscriptions" model, namely the free access.
- This critical distortion is the unbalanced way of remunerating artists and investment in the music industry.





Blockchain: a Solution to Global Issues in the Music Industry

- Along with these major global issues of the music industry, the Blockchain technology promises a different approach toward these issues. dotBlockchain Music – a young company from the United States of America, focused their interest in studying the file format divergences across the Internet and the file piracy issues and came up with the concept of a new digital online file format, namely “.bc” - dotBlockchain.
- This particular file format has its roots in the system of systems engineering of distributed databases and Blockchain technology. The high-security file format is designed to respond to the needs of technological innovation to achieve a balanced remuneration value towards the artists.
- The capabilities of such innovation will help the artists achieve their authority to decide what he or she wants to be done with its content in the digital virtual space era.

Thank You!

